

Future Crop of Export Business Must Be Sown in Depression Era

by Julius Klein

Assistant Secretary of Commerce



Concentration of merchandising efforts abroad at this time will build strong foundations for future foreign trade

AMONG all the retrogressive effects of any economic depression there are certain compensating developments which should be clearly appreciated and given appropriate importance by business executives.

Although a depression leaves many unfortunate consequences in its wake, it also acts as a cleansing medium which either sweeps away or exposes in clear view the ills which appear in the body of trade during a period of expansion and which commence as small and unnoticed symptoms but develop into malignant forces which strike at the roots of economic well-being.

The present depression is no exception to the rule. As the business recession wore on we were able to perceive and appreciate the unfortunate results of some practices which had been allowed to develop in our business organization at home and abroad and to devise corrective measures to eliminate those practices.

Now that there are evidences of an upward trend from the bottom of the depression it is imperative that we lay careful plans for the future, analyze sales possibilities at home and abroad more carefully than ever before, develop the type of organization which will be adequate and competent to exploit those opportunities and place the emphasis of our efforts in those territories which most require concentrated attention.

The depression caused a curtailment of sales of automobiles in most of our foreign markets and our automotive export trade declined accordingly. But the purging effects of the depression have also been at work in those markets, and reports from abroad continually refer to the elimination of business establishments which had never been in a fundamentally sound position—companies whose activities may have provided another channel for sales of motor vehicles but were not conducive to the development of a basically strong motor trade.

Although this disruption of the merchandising organization in many foreign countries has had

some demoralizing effect, the ground has been cleared for those stronger companies which have been able to weather the storm, and the markets are ready for the development of a more virile and well-established trade.

It is commonplace to refer to the outstanding position which the automotive industry occupies in our national economic life. It has become a symbol of mechanical and technical progress and of a new and more efficient type of rapid transportation. The American car and truck have carried that symbolism to all parts of the world and developed a prestige for our motor vehicles which has established an enviable reputation in the minds of the peoples of all countries. That reputation is priceless business goodwill which must be appraised and protected as carefully as the automotive manufacturer cherishes the goodwill of the trade name of his product.

Farsight is Necessary

To form a correct and clear estimate of the future of our automobile export trade it is necessary to divorce from our reasoning the apparent difficulties of today and look farther into the future. The last decade has witnessed an unprecedented development and improvement of transport facilities abroad and an unparalleled interest in foreign countries in the problems of transportation.

Each country has had an opportunity to observe the close relationship between improved transportation and economic development and to perceive the important role played by the motor vehicle in this drama of progress. It is only necessary to consider the growing interest in highway construction in all parts of the world to realize the recognition of the indispensability of the automobile and the certain future demand for motor transportation.

The Far East, Latin America, Africa, the Near East, Europe—all present examples of progressive nations which are moving forward toward greater material and social accomplishments. That their progress has been temporarily checked by a world-wide economic disturbance has little to do with our present consideration of their future as automotive markets.

What is really important is:

That the idea of the motor vehicle has been forcibly impressed upon the minds of their people;

That the American automobile in particular has risen to a dominant position in their markets:

That more and better highways are being built to accommodate the greater number of automobiles which will be needed to speed their march of progress.

These are the salient facts which should dominate any survey of our future automotive export trade and overshadow the more obvious and sensational present conditions which must be regarded as abnormal unless we are willing to deny the future economic progress of the world.

The relatively low ratio of automobiles to population in most foreign countries is one indication of the possibilities there for an expansion of motor sales. It is true that in many of these countries the low purchasing power of the bulk of the population limits the de-

To weaken export efforts, or to fail to appreciate the future importance of foreign markets, would be to open the door to foreign competitors and diminish the prestige of American automobiles abroad + + + + +

mand for motor vehicles but it is not necessarily true that this condition will last indefinitely.

The great industrial nations require raw products and the revival of world industrial activity will inevitably increase the buying ability of the countries which supply those products.

We have only to consider the importance of the demand for motor vehicles by the native population of the East Indies, India and the Near East—not to mention other parts of the Far East, South America and parts of Africa—to envisage the future opportunities which may be expected to develop in those regions.

If we survey briefly the present condition of the motor trade in a great many of our foreign markets we discover many tendencies similar to those in our domestic market. Reduced buying power and the adverse psychological effects of a depression have curtailed sales materially. But there is abundant evidence that the automobiles already sold are being kept in operation and are depreciating in the hands of the same owner to a much greater extent than at any time during recent years.

Vast Market Awaiting

This means one of two things: Either the present owners of automobiles abroad will abandon motor transportation and return to the plodding conveyances of the past, or they will enter the market at the earliest opportunity and purchase replacements of their present vehicles. It would certainly be an outrage to logic and reason to expect the first of the two alternatives. We must admit, therefore, that a vast reservoir of future sales is being stored up throughout the world. When that reservoir is tapped it will be imperative that American manufacturers are in a position to secure their full share of the business.

At no time more than in a period of depression is it so vitally necessary to preserve a strong and durable distribution organization in our foreign markets. And at no time do the efforts and expense required to preserve that organization seem less immediately productive or more discouraging from the standpoint of quick returns.

But over-retrenchment in a time of depression is as dangerous a policy as over-expansion when sales are increasing rapidly. Concentration of efforts in foreign markets which fail to respond quickly because of adverse economic conditions is a wise and farsighted policy which resists the attacks of competition and builds a strong foundation for future trade. To weaken those efforts or to fail to appreciate the future importance of these markets would be to open the door to our competitors and diminish the prestige of the American automobile abroad.

The economic importance of our foreign trade in automotive products is too well known to require explanation here. In 1925, exports of automobiles from this country amounted to about 7 per cent of our domestic production; in 1928 to approximately 11 per cent, and in 1929 to 10 per cent. In 1930 the proportion dropped to 7 per cent because of the depression.

This additional business from abroad is an important
(Turn to page 110, please)

Refined Oils Necessary for Small, High-Speed Diesel

by
A. Ludlow Clayden

BIG Diesel engines can burn almost any sort of liquid fuel. Some fuel oils are cleaner burning than others, some give most power, some contain more sand and water than they should, but the big engine takes them all and does pretty well with any of them.

With the small, high-speed type of Diesel the exact nature of the fuel is highly important; oils which have undergone some refinement are essential, and even fairly highly refined fuels differ a great deal in their efficiency. It is mainly because of the small Diesel problem that the A.S.M.E. through a committee on Diesel fuels is proposing to father some real research work.

When we say Diesel engine we mean an engine in which the fuel is ignited by the high temperature of the air into which it is injected. It does not matter whether this heat is the same all through the mass of air, as when heat of compression is depended upon, or whether a part of that air is superheated by a hot spot of some sort.

The temperature necessary to ignite any particular oil when sprayed into air depends upon the pressure on the air. As the pressure increases the temperature necessary for ignition decreases. This is probably because the oxygen in the air is squeezed tighter into contact with the fuel particles. Now, it is highly important for an engine designer to know what temperature and what pressure are necessary to make sure of igniting any fuel expected to be used in the engine. To date there is hardly any information of real value available.

This sounds rather remarkable, but the absence of worth-while data is not due to any lack of effort to secure it but to the difficulty of the research. A great many chemists and engineers have built devices to measure the "ignition temperatures" of fuels in still air at normal pressure. The method generally has been to drop minute particles of fuel into a cup or onto a plate of which the temperature is accurately controlled. This sounds pretty simple, but the fact remains that different experimenters obtain widely different results, even when using fuels which are chemically pure substances like benzene or alcohol. In Germany, where the Diesel was born and reared, most of this work has been done, but England and the United States have added their quota. But many of the participants were not primarily interested in Diesel fuels. For instance, one of the best published papers in America studied the subject of ignition point as part of an investigation of fire hazards in lacquer drying ovens.

However, in such a mass of data, even though divergent, there are some things which stand out as common to all tests. One is that coal-tar oils, members of the benzol family, require much higher temperatures than do straight petroleum. The ignition temperature of benzol is perhaps twice that of gasoline on an

average. That of a heavy coal-tar oil twice as high as for a heavy petroleum fuel.

Another interesting high spot is that blends do not behave as they apparently ought to. For instance, a "fifty-fifty" blend of benzol and gasoline does not have an ignition point anywhere near the midway point between the two constituents. The very high ignition temperature of benzol is greatly lowered by the addition of small percentages of some other oils, oil of turpentine in particular. Pure chemical compounds which break up easily in most chemical reactions do not necessarily have low ignition points. The whole thing is a mystery. It is, however, highly probable that complex things, like most fuels, ignite by first breaking into something else under the pressure and heat. One of the breakdown products then actually takes fire and sets off the others. Since the average light Diesel fuel may contain some hundreds of different hydrocarbons, and since these may cover the whole petroleum range from paraffins to aromatics within a single fuel, it is easy to see that to predict the ignition point of a fuel by a study of its ordinary properties is a well-nigh hopeless prospect.

Another aspect of the subject which makes it still more difficult is that there is a phenomenon called ignition lag. A fuel may ignite at a given temperature and pressure if allowed enough time; in the case of some of the experiments this time might be a second or two. Other fuels ignite instantly when their minimum ignition temperature is reached. This observation encourages the view that under Diesel conditions fuel oils probably first break up and then take fire. Theoretically a fuel might have a low ignition point and yet be unusable because of too great a lag. That there is a very real difference in fuels in this respect is well known to engine operators. Lag can be offset to a great extent by advancing the injection, just as the spark is advanced in a gasoline engine.

If the A.S.M.E. committee is able to carry out its present intentions and get started a comprehensive research confined to recognized Diesel fuels the results cannot fail to be very useful. Complete data on, say, a dozen different American fuel oils of about the same physical specifications but from different sources would at least tell us the range of temperatures, pressures and lags we had to consider in engine designing.

Beyond this there is the prospect of studying blends more extensively. Possibly there is an equivalent for ethyl fluid which will potently affect the ignition point and lag—the effect of turpentine on benzene suggests this. But, however little is discovered, that little will be all to the good, for today we have practically nothing to go upon. The more recent changes in gasoline engine efficiency have been made possible entirely by the discovery of better gasolines. The development of the really small, high-speed Diesel could be helped even more perhaps by, first, more knowledge of the fuels we have and, next, the development of better fuels.

Adequate Costs

by Joseph Geschelin

tries. The objective is to weigh all the elements involved; to separate the tangibles from intangibles, and to set up a rational management formula. And what a man-sized job it is.

It is a fundamental matter which goes deeply into industry. It concerns progress, productivity and technological advances. And, above all, it has a direct bearing on company profits.

Many formulas have been published (someone recently estimated that about 25 are immediately available), but none of these seems to answer the purpose adequately. There is always something missing or something that does not check with current practice. Moreover, the existing formulas do not go far enough.

Manufacturing equipment affects many seemingly unrelated activities of management. It is intimately tied up with accounting practice, and it is quite conceivable that some of the existing notions and technique of accounting may have to be revamped. Among other things, a study of the selection and replacement of manufacturing equipment involves such matters as overhead practice, depreciation accounting, obsolescence, replacement programs and, finally, the maintenance of sinking funds for equipment replacement.

These are some of the factors which were discussed with much enthusiasm by a large number of men directly interested in the program. Among those entering into the discussion were R. E. Flanders (Jones & Lamson), E. P. Bullard (Bullard Co.), W. P. Kirk (Pratt & Whitney) and W. H. Rastall (Department of Commerce). To stimulate thinking along the desired channels, Professor Raymond presented ten topics, which appear in Table 1.

These questions cover a vast territory. The right answer to each one for any given individual problem would be Utopia itself. Quite naturally, *Automotive Industries* has done considerable work in this very field. Our contact with the largest users of machine tools in the industry, our work with the Society of Automotive Engineers and the A. S. M. E. machine shop practice division, and interviews with prominent

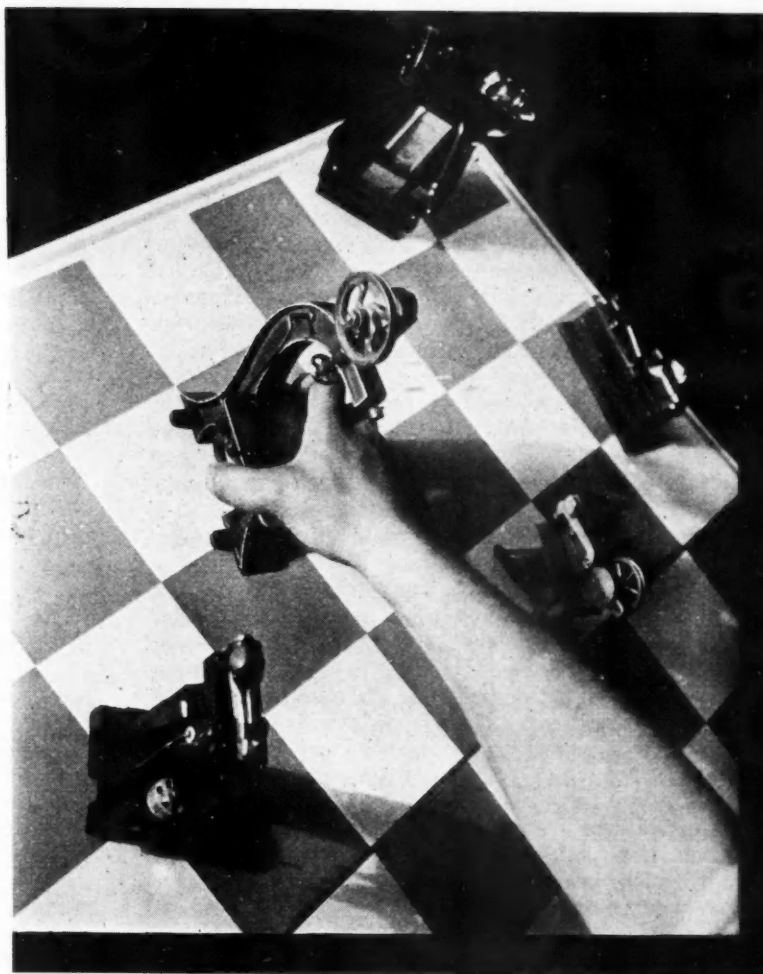


Photo by Geoffrey Grier

machine tool builders have given us a broad background. Accordingly in this article we propose to dwell in some detail on each of these topics in the light of this experience, as well as the opinions expressed at the meeting. Readers are urged to present their views so that the mutual interchange of ideas may be contributed to the study under way.

For convenience we shall discuss each item separately in the order it appears in Table 1.

1. What are the economic factors?

In *Automotive Industries*, June 25, 1930,* we published the results of a study in automotive plants; the conclusions reached in that paper will answer this question, at least in part. From the production executive's point of view only, the chief factors are:

1. (a) Accuracy in dimensions. (b) Quality of finish.
2. Productivity or production rate.
3. Upkeep or maintenance costs.

But there are other matters in the broad picture which may be listed as follows:

4. Technological advances. (a) In the design of equipment. (b) Due to changes in methods and processes, such as, for example, the recent introduction of cemented tungsten carbide tools.
5. Changes in product design.
6. More economical utilization of floor space. New

*"Accuracy, Speed and Operating Costs of Machine Tools Help Determine Service Value," by Joseph Geschelin.

equipment is frequently justified on this count alone, according to a consensus of opinion.

8. Decision as to whether standard or single purpose machines should be used. This depends entirely upon the individual problem. There is a general movement away from single purpose machines as such, although there are many places where single purpose machines are justified and economical.

A point of view outside of the automotive industry was expressed recently by E. C. Brandt, assistant works manager, Westinghouse Electric & Mfg. Co., at the production conference of the American Management Association. He said in part, "A conclusion which I have reached regarding the type of building, type of equipment, plant planning and layout, for any manufacturing is that only in such cases where the quantity warrants single purpose, special machine tools laid out should machinery be placed in sequence of operation, and set up for one operation after another without any interference or breakdown of setup."

2. What method should be employed in determining the economic life of equipment?

This is decidedly open to considerable discussion. It is a variable, and depends upon many factors, some of which are purely judgment factors. It depends, too, upon whether one is buying new equipment to supplement existing facilities or whether the problem is one of replacement. In the automotive industry, production men expect a new machine to pay for itself within a given time. Sound, of course. But they make this time limit one or two years, thus imposing a prohibitive depreciation rate of 50 per cent per year. Wherever this policy is followed too blindly, it will prevent healthy progress.

For standard machines it should be possible to establish some economical limits within the boundaries of technological obsolescence and physical life. Such figures are not available at the present time. The nearest approach was the study made by the Bureau of Internal Revenue in connection with their depreciation studies. Some reliable agency should initiate a study of this phase of the problem based on mortality technique.

3. How large an investment is justified?

This is pretty well tied up with the considerations in question one. If a machine can pay for itself within a given limited time, it is economically justifiable and probably will be purchased. But it is also true that if someone produces a machine that will make a saving in floor space where floor space is essential, the machine will be bought regardless of other considerations. By the same token, equipment is frequently purchased because superior quality is required. Again, if an unusual sales demand occurs, equipment producing greater productivity will be installed. These and many other variables make hard and fast rules impossible.

4. How is equipment replacement policy influenced by salvage or resale values?

Experience indicates that this is an important question. In fact, salvage value forms an integral part of practically every replacement study. In some industries an effort is being made to scrap obsolete equipment to prevent its use by other manufacturers in the same competitive group.

5. To what extent does the relative capacity of the new and old equipment affect the realization of anticipated operating economies?

Wherever volume is a factor, the productivity of manufacturing equipment easily predominates. And, by the same token, the limited productivity of the older

The second of this series of studies on replacement of machine tools will appear in a forthcoming issue of *Automotive Industries* + +

The author will discuss the problems of the machine tool builder, particularly in selling and servicing his equipment + + + + +

equipment lays further emphasis on the new, whenever sales volume steps up.

Consideration of seasonal or cyclic fluctuations. Seasonal fluctuations in demand undoubtedly exercise an important effect on the probable return from new equipment, perhaps even more than we realize. An-

Fig. 2

FINANCIAL STATEMENT

Part No: _____

SAVING PER PIECE

| | | | |
|------------------------|-----------|----------|------------|
| Direct Labor | @ \$ | per hour | |
| Overhead | @ \$ | " " | |
| Total cost | " " | or \$ | per minute |
| Present Cost per Piece | Minutes X | | \$ |
| Cost with W&S Method | Minutes X | | \$ |
| Savings per Piece | | | |

.....

LOT PRODUCTION

With _____ pieces in lot, Saving per Lot = \$ (a)

With _____ lots per year, Saving per Year = \$

.....

LARGE QUANTITY PRODUCTION

Production Per Day (Using 48 minute hour to allow for usual delays) = _____ Pieces per Day

48 Minutes X _____ Hours per Day = _____ Minutes per Piece (W & S Method)

Total Saving per Day = _____ Pos per day x _____ Saving per Pc. = \$

Gross Saving per Year = _____ Saving per day x 280 Working Days = \$

.....

INVESTMENT

W & S Turret Lathe with Std. Tools \$ _____

Less Second Hand Value of Present Equip. \$ _____

Net Investment - Machine & Std. Tools \$ _____

Plus Cost of Special Tools \$ _____

Total Net Investment \$ _____

.....

NET PROFIT (FIRST YEAR)

| | |
|--|----------|
| Gross Saving per Year | \$ _____ |
| Machine & Standard Tool Depreciation @ 20% | \$ _____ |
| Special Tool Depreciation @ 100% | \$ _____ |
| Less Total Depreciation | \$ _____ |
| Net Saving for First Year | \$ _____ |

Profit on Investment (1st Year) = (Net Saving per Year) \$ _____ = _____%

(Total Net Investment)

.....

NET PROFIT (SECOND YEAR)

| | |
|---|----------|
| Gross Saving per Year | \$ _____ |
| Less Machine & Std. Tool Depreciation @ 20% | \$ _____ |
| Net Saving for Second Year | \$ _____ |

Profit on Investment (2nd Year) = (Net Saving for 2nd Year) \$ _____ = _____%

(Total Net Investment)

.....

(*) If the statement is to cover the performance of the turret lathe on several different parts, it is necessary to average the savings for all parts and average the number of pieces per lot for the entire group of parts to obtain a simple condensed financial statement.

Warner & Swasey financial statement used in demonstrating service value of new machines

anticipated returns must be based accurately on sales forecast, and the calculations made on the basis of probable yearly sales. This information is available in the production setup of most automotive plants.

A very interesting plan in this connection was discussed by C. S. Carney, vice-president of the Trundle Engineering Co., at the production conference of the American Management Association. Mr. Carney suggests that depreciation rates should be varied in

accordance with fluctuations in sales or production volume. It should be heavy during times of normal production and proportionately lower during a seasonal decline. This procedure would make a much more attractive profit statement.

6. What provision should be made to guarantee an adequate return?

One of the best suggestions we have heard in a long time was made by E. F. Dubrul at the S. A. E. production meeting in Milwaukee this spring. He proposed the use of a distinct depreciation charge to be carried as an item in the selling price. This amount would be deductible from accounts receivable and immediately transferred to a sinking fund set apart for replacement.

7. What constitutes obsolescence of productive equipment?

Obsolescence may be due to any one or a combination of the following factors:

1. Changes in the product.
2. Improvements in methods and processes.
3. Technological improvements in manufacturing equipment.

Incidentally, these are the most potent factors to consider when deciding whether standard or single purpose machines will be purchased. In general, single purpose equipment will be profoundly affected by a change in product. The standard machine, on the other hand, can be readily salvaged, either by refitting with new fixtures or by shifting to another job or department.

A quantitative measure of one type of obsolescence was given in the study already mentioned. It was suggested there that a machine could be profitably replaced whenever maintenance (including interest on investment, depreciation and upkeep) approaches 20 per cent of the cost of a new machine. This is indeed an interesting angle to explore.

How may the risk of obsolescence be measured? This is another one of those intangibles. It is decided by a judgment factor and depends upon management policies and the effectiveness of the planning program. However, here, too, enter the considerations of whether a standard or single purpose machine should be installed. Where large volume predominates, a special machine may pay for itself during the limited time prescribed. But a new movement is making itself felt in this connection. More and more, machine tool builders are building unit type machines. It is single purpose equipment in effect, but may be readily converted to other work by replacing perhaps 25 to 30 per cent of the value of the new machine. Another significant swing in this direction is the use of heavy duty standard machines with interchangeable multiple-spindle heads for drilling, tapping, boring and similar operations. And frequently combinations of these in the same head. By this means a remarkable degree of flexibility is attained at a reasonably low capital investment. This kind of arrangement is indicated for a moderate production program involving a variety of parts over the same line.

8. Discussion of depreciation and its effect.

Much confusion exists concerning depreciation accounting. Of all the factors involved, this is one at least that should not be subject to personal judgment. Yet, it generally is.

To our mind, nothing has obscured the issue more than the persistent linking of depreciation with the age of machines. Let's get this straight. Under some conditions a machine 10, 15 or 20 years old may be perfectly adequate. Yet, in the same shop, another

machine two or three years old may be absolutely worthless because of obsolescence before normal depreciation. A sharp distinction must be drawn between obsolescence and depreciation, and the final criterion is the one given in question one.

We may, therefore, state as an axiom that productivity and adequacy are the prime requisites to be considered, not only in replacement of equipment but also in its selection.

Another deep-rooted custom is that of assigning a figure of ten years to represent the normal life of manufacturing equipment. No one has proved this, nor has an actuarial study been published to substantiate this, so far as we can learn. Yet, the adherence to this and other inherited conceptions is costing industry vast sums of money. In many small plants it is considered good management to keep old equipment going indefinitely. Why, in many cases the maintenance expense alone, over a period of several years, will pay partly for a new machine which would probably replace several of the old ones!

Should an actual sinking fund be established? Decidedly yes. In principle it is the practice of all companies to set aside a sinking fund commonly as a depreciation account. But frankly this fund is seldom if ever available for the actual purchase of equipment. Usually it finds its way into some other accounts or even into inventory. Yet because this fund is not ordinarily available, the manufacturing department is unable to install the equipment necessary to turn out the product at a higher rate, better quality and lower cost. In the long run there is a serious economic loss.

A planned replacement program is urgently needed in industry today. The foundation for this would be a definite sinking fund available only for the replacement of manufacturing equipment. The replacement program would provide for the retirement of a certain number of machines at regular intervals. But, in addition, the sinking fund would permit the operating department to take advantage of technological advances whenever economically justified.

A large group of important industrial concerns has been operating on a planned replacement program. Among these, the Union Special Machine Co. of Chicago has just made public the system used in its own factory. The basis of the system is a card record for each machine as shown in Fig. 1. The study involved in keeping this card record up to date will eliminate many intangible and judgment factors. On the basis of their own experience, this company lists the following advantages for a planned replacement program controlled by a record such as Fig. 1.

"1. The time for taking inventories is reduced, and, in fact, machine operation need not be interrupted.

"2. Attention is constantly directed toward each individual machine. Thus wasteful and inefficient units are quickly detected and exposed with the evidence of their faulty performance prepared in a form suitable for presentation to those in authority.

"3. By this method of directing attention to the mechanical equipment, officials of the operating department are automatically forced to keep in touch with all new developments and improvements in methods.

"4. The ordering of replacements and repairs is facilitated, and minimum time is wasted by machines idle during operating time.

"5. The financial operations of the company are safeguarded through maintaining a constant balance of the appropriation for new equipment and as a result, by avoiding unexpected expenditures."

(Turn to page 96, please)

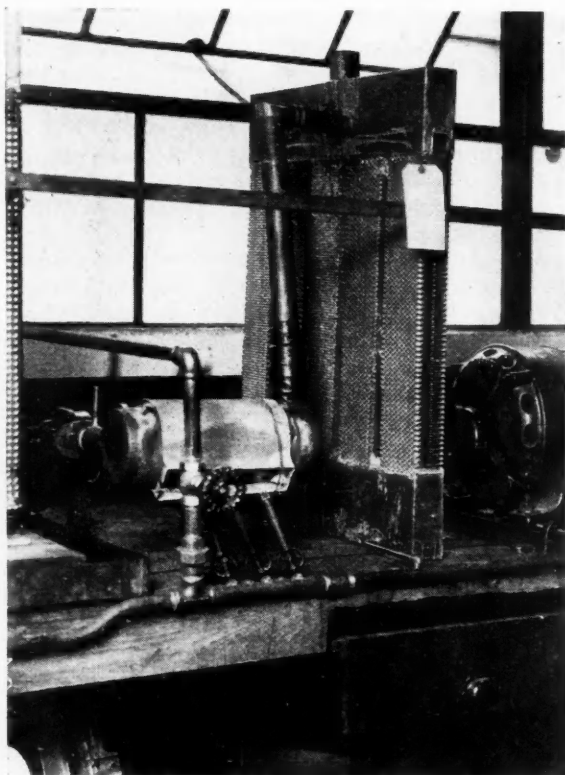


Fig. 1—A close-up of the circulating apparatus used to test coolants and different makes of radiators. These composite radiators are made up of sections from different makes and types of cores. The motor operates the water pumps + + + +

gation recently in the laboratory of the Linde Air Products Co.

Since controlled test conditions could not be duplicated with any degree of accuracy in actual automobiles, apparatus which would accurately simulate normal operating conditions had to be developed and used for this work. However, in addition to laboratory tests, actual field tests were conducted in 990 automobiles which were driven more than 5,000,000 miles while under observation.

Various types of test apparatus were developed and used. One of these test devices which produced most interesting results was the so-called "circulating apparatus." A close-up view of one composite radiator unit is shown in Fig. 1. Fig. 2 shows details of the assembly.

Each circulating unit consisted in general of the radiator, a water pump, the iron heater, and the hose connections. The test radiators were of two types: the standard single radiator and the composite radiator. The single radiator was made up by soldering top and bottom tanks to standard cores, purchased from various radiator supply houses. The composite radiators were made by soldering common top and bottom tanks to five separate 3½-in. sections of standard radiator cores. Of these five sections, two were copper and three brass, this combination being such that the effect of the various cooling media on the different metals could be carefully and accurately checked. Only new, un-

SOME years ago there was much talk, particularly in the field, about the corrosive effects of anti-freezes in general on the metals of the cooling system. Little definite knowledge was at hand concerning the action of water, heat, aeration, and anti-freeze on solder, copper, iron, brass, aluminum and rubber—the materials most commonly used in cooling systems. The processes of radiator clogging and radiator disintegration had not been intensively studied. All these subjects have been under investi-

Corrosion Plays a Minor

By William H. Wilson*

National Carbon Co., Inc.

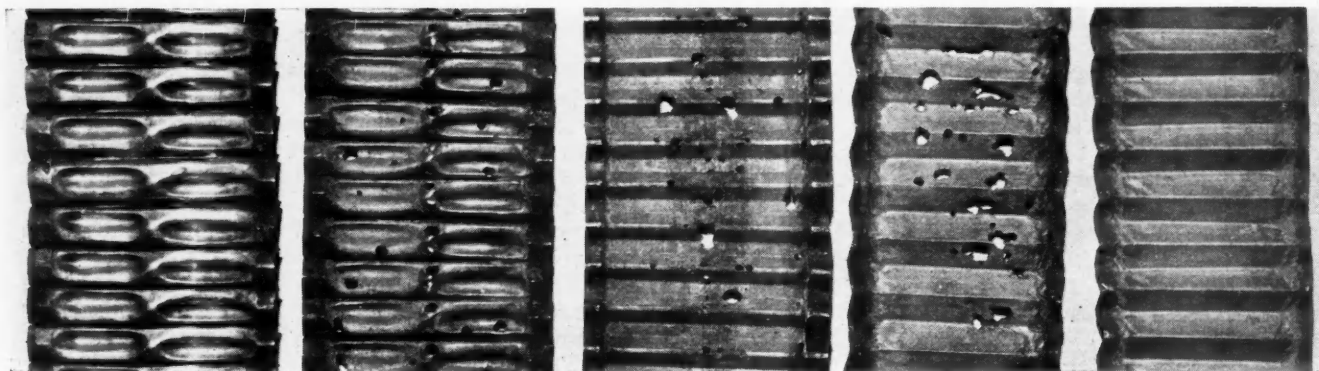


Fig. 3—Five strips from the five sections of a composite core in which water was circulated for 800 hr. The three brass sections in the center were badly corroded. Note that the solder is bright and undamaged + + + +

*Research work conducted by Research Laboratory of the Linde Air Products Co.

used cores were used for these laboratory tests.

Heat was supplied by means of three Tirrill burners. The amount of heat and the subsequent coolant temperature were controlled by regulating the burners. The connections between the radiator and the heater consisted of iron pipes, standard hose and clamps. Tap water and water solutions of the common types of anti-freezes were heated and circulated each in a separate test unit. Temperatures were recorded by means of mercury thermometers. The filler was left open to admit air, since the regular overflow pipe, one source of aeration in service, was not present.

The temperature of the circulated coolant was maintained between 190 and 200 deg., Fahr., which is a little higher than that at which most automobiles operate, and thus the test was more severe than actual cooling system service. The tests were run continuously, day and night, for five and one-half days each week. The units were allowed to stand cold and idle over the week-end. Approximately every 50 hours samples of the test liquids were withdrawn from the units for inspection and analysis. The liquids were also continually examined for accumulations of rust or other evidences of corrosive action on the test apparatus. After the test runs were completed, the units were disassembled and examined to determine the effect of the coolants on the different parts.

These circulating units were run for a total of

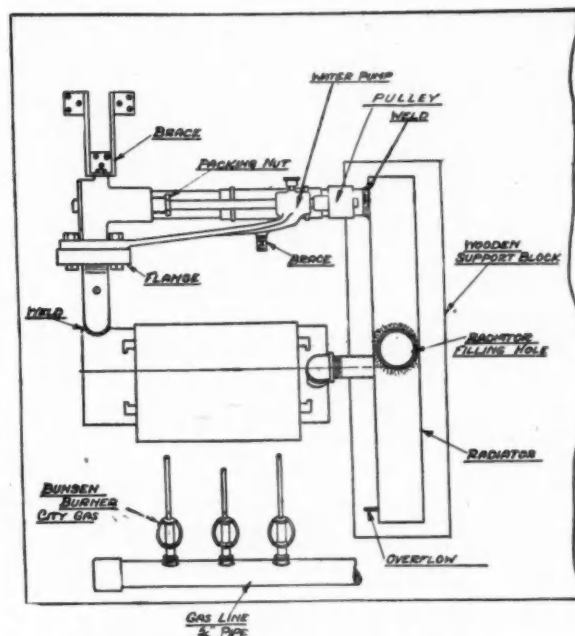


Fig. 2—This drawing shows details of construction of the circulating apparatus

Part in Radiator Solder-Seam Failure

Mechanical breakage is responsible for most radiator leakage, according to results of research conducted by units of Union Carbon and Carbide Corporation + +

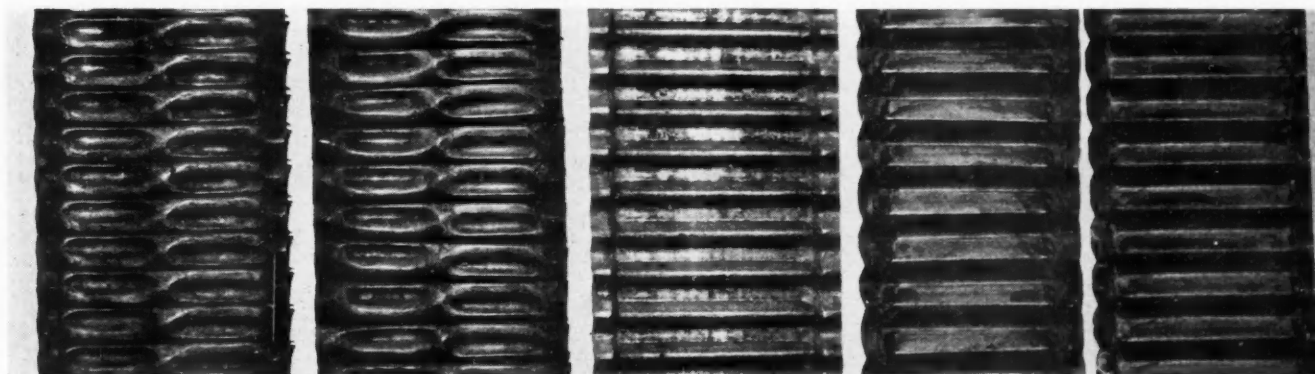


Fig. 4—Here are five strips from a composite core in which a non-electrolytic, anti-freeze solution was circulated for 800 hr. After cleaning, neither the metal nor the solder seams show any signs of corrosion + + + + +

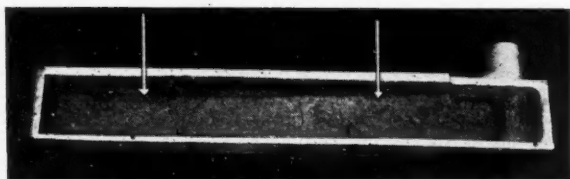


Fig. 5—The arrows show how the products of corrosion, excess grease and foreign matter can accumulate in the bottom tank of the radiator and prevent proper circulation of the coolant + + + + +

1400 hr., and during 830 hr. of that time the liquid temperature at the heater outlet was maintained between 190 to 200 deg. Fahr. At an average road speed of 20 to 25 m.p.h. these tests represented about 20,000 miles of driving.

In the circulating units containing ordinary tap waters the brass radiator cores began to show leaks after about 300 hr. of operation. From this time until the end of the tests, 4 to 6 qt. of water had to be added daily to make up for leakage and evaporation losses, whereas the original evaporation loss was less than a quart a day. When the water passages of these radiators were opened for inspection, the solder bonds of all of the cores were in very good condition, showing little evidence of corrosion, and no leakage, *although the brass was badly perforated.*

These results, rather unexpected in view of the leaks, indicated one thing of importance: namely, that road shock and vibration *must* play a very important part in solder failure. In spite of the fact that these tests were run for more than 800 hours, under conditions more severe than would be normally encountered in service, except for the fact that no vibration was present, the soldered seams showed no appreciable deterioration. It is known that radiators on automobiles are prone to show up solder seam leakage under 20,000 miles of driving, so it is evident that corrosion is not the fundamental cause.

In order to produce the type of solder failure usually encountered in automobile radiators in actual service, road shock and vibration are necessary. These mechanical actions tend to stress and crack the solder bonds, with the result that the solder may fail. Field tests have substantiated this conclusion.

The appearance of the water passages of the various radiator cores after the tests is best illustrated by the photographs, Figs. 3 and 4, showing the effects of tap water and of Eveready Prestone solutions respectively on the radiator cores. All of these cores were subjected to identical test conditions, so that the results are comparable. It will be noted on Fig. 3 that the three brass radiator sections which had been part of the units in which water was circulated are full of holes, whereas the copper ribbons on the extreme right and left were unharmed. In both cases

the solder bonds were in very good condition. Some of the holes in the brass sections were present on opening the water passages, while others were made by piercing the corroded metal with a toothpick. In these cases, the metal was so corroded and fragile that very little pressure was sufficient to penetrate the metal passage. This shows very clearly that the brass strips were badly corroded by water alone, whereas the copper strips were in very good condition—no signs of corrosion of the copper sections could be detected. As seen from Fig. 4, both the brass and copper radiator strips from the test units containing Eveready Prestone solutions showed no signs of corrosion, either in the solder bonds or in the passage metal proper.

Water Often Sets Up Corrosion

The conclusions can be summarized as follows:

- (1) The solder used in the manufacture of the five most commonly used makes of cellular radiators has considerable resistance to corrosion. Road shock and vibration are evidently necessary to produce the type of solder failure usually found in automobile radiators in the field.
- (2) Water can have a very severe corrosive action on brass radiators. Anti-freeze solutions caused no apparent corrosion of brass, whereas ordinary water corroded brass water passages sufficiently to cause the appearance of many leaks in the form of small, round holes, or weak spots down the center of the ribbon.

In general, tap waters having a high chloride or magnesia content have the property of dissolving the zinc from brass. This type of corrosion is generally called "dezincification" of brass. The salt impurities in tap waters may concentrate in spots on brass water

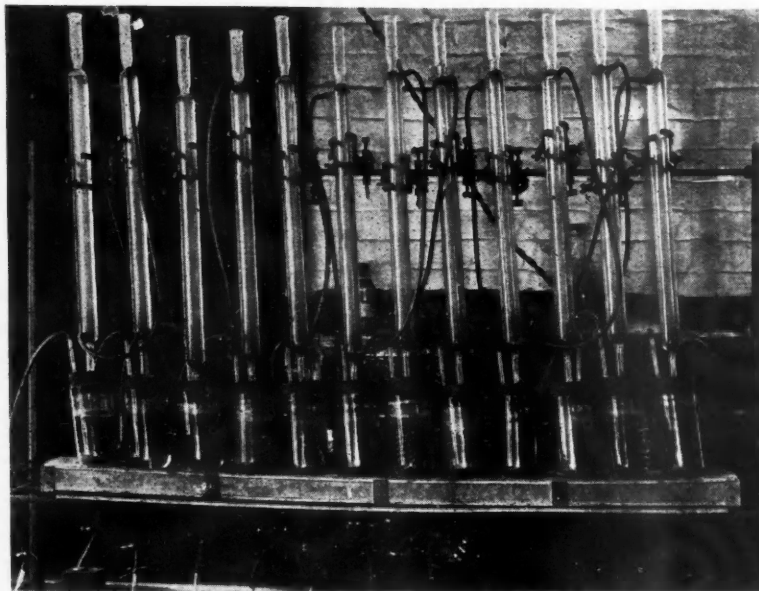


Fig. 6—One type of glass apparatus used to test radiator metals for the result of electrolytic corrosion in distilled water and distilled water-anti-freeze solutions + + +

passages and cause dezincification, with the result that the metal is left in an extremely porous and fragile condition.

- (3) Since dezincification is primarily a type of electrolytic corrosion, it follows that permanent organic anti-freezes, such as Eveready Prestone, which are non-electrolytes, will tend to minimize such action in cooling systems as was shown in tests. However, it is quite possible for the salt concentrations of certain tap waters to be sufficiently great to offset the neutralizing action of a non-electrolytic anti-freeze.

In connection with the observations in Section 2, there is another factor which will hasten electrolytic corrosion in brass radiators. This is the action generally termed "season cracking" of brass.

Season cracking usually appears as large, irregular and jagged openings which form in the brass directly at the edge of the soldered seams. This is the location where the greatest stress in cold working is applied when the flat brass ribbon is formed into crimped water passages. If internal stresses are present in brass, it becomes more susceptible to electrolytic corrosion and to the effects of vibration, with the result that leakage may readily occur.

Radiator failure due to season cracking is caused by improper forming of the brass water passages during the manufacturing operations, and also because of the quality of the stock. However, this condition occurs in relatively few cases.

Dissolved Oxygen Causes Damage

While corrosion and solder failure are instrumental in putting a large number of radiators out of service, just as many if not more are junked because of rust and scale clogging, which is caused by corrosive oxidation of the iron water jacket of the engine.

Corrosion or rusting of iron is caused by the presence of dissolved oxygen in the cooling liquid as well as by electrolysis. This dissolved oxygen, in the presence of water, reacts with the iron exposed to the coolant, forming the familiar rust. Dissolved oxygen is present in all coolants in automobiles, due to the fact that the cooling liquids are continuously exposed to air. The breather or overflow pipe in radiator top tanks allows air to accumulate over the cooling liquid. The rapid circulation of the coolant during engine operation causes inclusion of this air in the coolant. Air may also be drawn into the system through circulating pump packing glands and lower hose connection if these are not properly adjusted and tightened.

The corrosion or rusting of the iron water jackets is not serious as far as possible damage to the engine block is concerned. However, the rust which is formed may be carried by the coolant into the radiator and deposited in the water passages. The gradual accumulation of rust and scale in radiator water passages in this manner may ultimately plug radiators to the extent where engine overheating and boiling may occur because of the restriction of circulation.

Grease Binds Rust Particles

Fig. 5 shows a deposit of corrosion products in a lower radiator tank. This material was from two to three inches deep and very tightly packed. Analysis of this material reveals the presence of

considerable grease, which acts as a binder for rust particles. This grease is no doubt introduced through over-lubrication of the water pump in service with other than waterproof grease. Some samples contain as high as 10 per cent of grease. The largest quantity of rust ever found in suspension in actual service was between 35 and 40 grams of rust per gallon of liquid.

The results of corrosion tests made in laboratory apparatus are of interest in illustrating the effect of aeration on the corrosion of cooling system metals. Fig. 6 is a photograph of the test apparatus used.

Each series of tests was run for 200 consecutive hours at 200 deg. Fahr. The metal test specimens were made of iron, copper, solder and brass and also small sections of standard radiator cores. The exposed surface area of the test specimens was about 12 sq. in.

Aeration Increases Corrosion

Following is a table of some typical test results, using distilled water as the test liquid, showing the effects of aeration on corrosion. The use of distilled water eliminated the type of corrosion which may be caused by salt impurities in tap waters.

| Test Metal | Corrosion loss in milligrams per 200 hr. at 200 deg. Fahr. per 12 sq. in. of exposed area | |
|--------------|---|---------------|
| | Water Not Aerated | Water Aerated |
| Copper | 9 | 14 |
| Brass | 10 | 16 |
| Solder | 10 | 29 |
| Iron | 55 | 2,500 |

These tests demonstrate that aeration will cause increased corrosion of all cooling system metals, but iron is affected much more than the others. It becomes evident from this that the oxidation corrosion of radiators is negligible when compared with the quantity of rust which may be formed in the engine jackets.

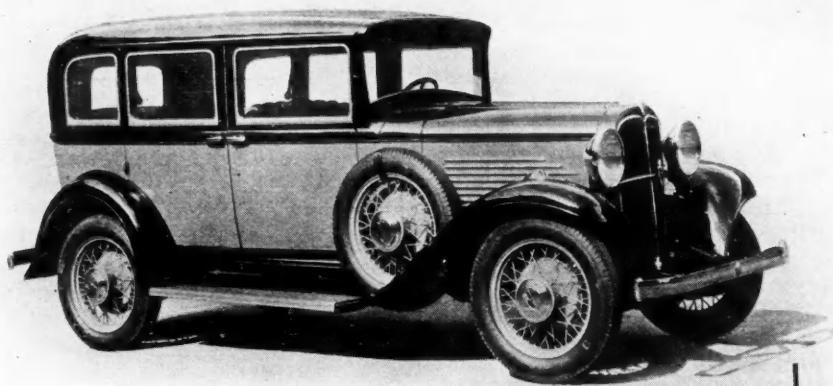
Rusting of iron engine water jackets and subsequent radiator plugging and overheating is the result of electrolytic and oxidation corrosion, and a coolant having the property of minimizing, or eliminating, this corrosion will be a distinct step toward improving the operation of automobile cooling systems.

Perhaps the most important result of this research is that in the new Eveready Prestone there is available a permanent anti-freeze that reduces corrosion of cooling system metals greatly below that caused by water.

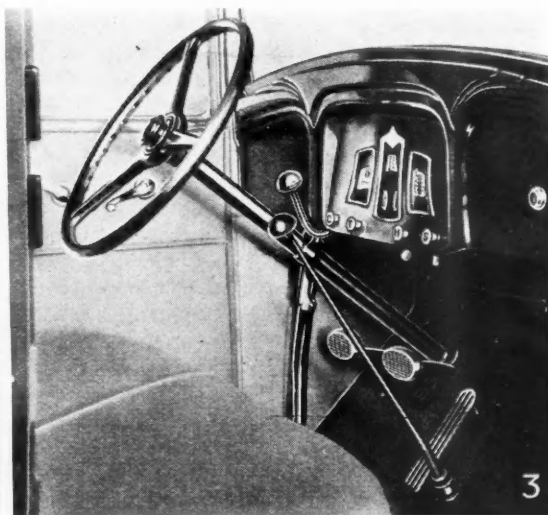
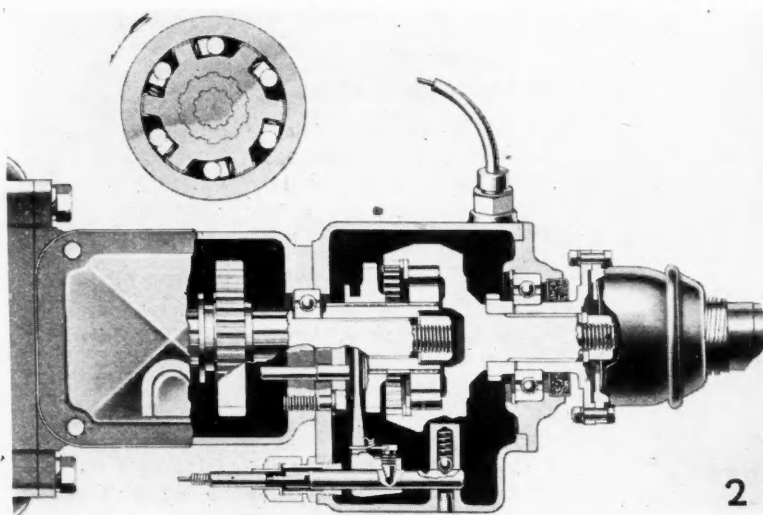
The following table of corrosion tests, made in the glass corrosion apparatus already described, illustrates this. These results are averages of a large number of tests on various cast irons and makes of copper and brass radiators.

| Test Solution | Corrosion loss in milligrams per 200 hr. at 200 deg. Fahr. per 12 sq. in. exposed area | | |
|--|--|--------|-------|
| | Iron | Copper | Brass |
| Distilled water | 3,955 | 200 | 278 |
| Mid-West tap water | 4,575 | 295 | 307 |
| 35 per cent Eveready Prestone in distilled water | 225 | 63 | 81 |
| 35 per cent Eveready Prestone in Mid-West tap water | 293 | 76 | 95 |

On the basis of these test results, Prestone was found to reduce corrosion of iron to a practical minimum, and the coolant also effected a material decrease in the corrosion of the copper and brass radiators tested.



Willys Offers



Specifications of Willys-Knight, Model 95

Frame—Channel section, $5\frac{1}{4} \times 2\frac{1}{4} \times 9/64$ in. Six cross members. Wheelbase—113 in.

Front Springs—Semi-elliptic, $36\frac{1}{2} \times 1\frac{1}{4}$ in., chrome vanadium steel.

Rear Springs—Semi-elliptic, $51 \times 1\frac{1}{4}$ in., chrome vanadium steel, Tryon spring shackles, Hotchkiss drive. Alemite pressure-gun lubrication to all chassis parts.

Wheels—Six wire wheels standard. Semi-drop-center rims.

Tires—19 x 15 in. balloons.

Front Axle—Reverse Elliott type, tubular steel, heat-treated. Timken bearings in wheels and Timken thrust bearings in knuckles.

Steering gear—Worm and sector type, 13-to-1 ratio. Steel-reinforced hard-rubber wheel, 17 in. in diameter, on adjustable steering post.

Rear Axle—Semi-floating type, with pressed-steel banjo housing. Gear ratio, 4.89 to 1. Timken bearings throughout. Axle shafts removable; diameter at bearings, $1\frac{1}{2}$ in.; 10 splines. Differential of two-pinion type, with malleable-iron housing. Spiral bevel ring gear and pinion of alloy steel, stem-type pinion.

Brakes—Bendix Duo-Servo, four-wheel, internal, two-shoe type, with cable control. Total braking area, 143 sq. in. Hand brake operates on all four wheels.

Propeller Shaft—Double-universal joint type, 2 in. in diameter. Universal joints, Spicer metal type, oil-lubricated.

Engine—Six-cylinder Knight type, 2.15/16-in. bore by 4 $\frac{3}{4}$ -in. stroke. Piston displacement, 177.9 cu. in. Output, 60 hp. at 3400 r.p.m. Compression ratio, 5.55 to 1. Silent timing chain for eccentric shaft and generator driveshaft is $1\frac{1}{4}$ in. wide and has automatic adjustment.

Crankshaft—Weight, 50 lb.; drop-forged steel, heat treated; machined, ground and lapped.

Bearing Sizes—Front, $2\frac{3}{8} \times 2$ in. First intermediate, $2\frac{3}{8} \times 1\frac{1}{4}$ in. Second intermediate, $2\frac{3}{8} \times 1\frac{1}{4}$ in. Center, $2\frac{3}{8} \times 2\frac{7}{16}$ in. Third intermediate, $2\frac{3}{8} \times 1\frac{1}{4}$ in. Fourth intermediate, $2\frac{3}{8} \times 1\frac{1}{4}$ in. Rear, $2\frac{3}{8} \times 2\frac{1}{2}$ in. Total bearing area, 89.07 sq. in.

Connecting Rods—Drop-forged steel, I-section, 10 in. long. Centrifugally cast babbitt bearings, 2 in. diameter by $1\frac{15}{16}$ in. long.

Pistons—Aluminum alloy, Nelson type, wide Invar steel strut. Piston pin bearing, bronze, diamond bored, $51/64 \times 1\frac{1}{8}$ in. Piston pin, full floating type, $51/64 \times 2\frac{1}{2}$ in. Piston rings, four, one $5/32$ -in. oil ring, three $3/8$ -in. compression rings.

Oil Capacity—Eight quarts. Skinner oil rectifier, mounted on left side of engine.

Clutch—Single-plate, dry-disk type.

Transmission—Three-speed, selective type. Gear ratios: Low, 2.7 to 1; second, 1.53 to 1; high, 1 to 1; reverse, 3.33 to 1.

Cooling System—Cellular radiator, 3 $\frac{3}{4}$ -gal. capacity; centrifugal pump in unit with fan; four-blade fan, driven by adjustable V-belt; thermostatically controlled automatic air shutter at extra cost.

Fuel System—Gasoline tank at rear, 13-gal. capacity. Pump feed. Manual heat control on inlet manifold. Automatic fuemer.

Ignition—Auto-Lite battery system, semi-automatic spark control.

Generator—Auto-Lite, swinging-brush type, driven by timing chain.

Starting Motor—Auto-Lite, acting on flywheel through Bendix drive.

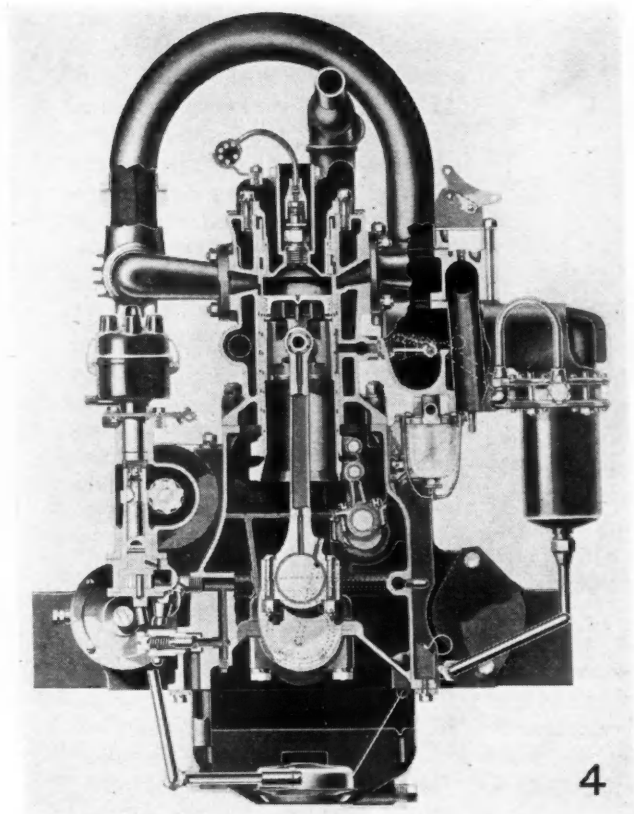
Battery—USL 13-plate, 127-ampere-hour.

Lamp Equipment—Chromium-plated parabolic head lamps, Twi-Lite lens, $10\frac{1}{8}$ -in. diameter. Two-filament, 21-c.p. bulbs, double contact, tilt beam. Fender lamps, 3 c.p., single contact. Combination tail and stop light, double filament, 21 c.p., double contact. Dash lights, 3 c.p., single contact.

Equipment—Hydraulic shock eliminators, front and rear; Mono-control, non-glare windshield on closed cars, remote door controls and adjustable front seat. Speedometer, oil gage, heat indicator, ammeter and gasoline gage attractively grouped on instrument panel. Automatic windshield cleaner, rear-view mirror, dome light in coach and sedan, combination stop and tail light. Parking lights. High-pressure grease gun for lubrication of chassis. Gasoline filter and combined air cleaner and silencer. Set of tools.

60 h.p. Knight Powered Six at \$845

Crankcase ventilation provided to reduce dilution and furnishes additional lubrication for upper ends of pistons and valve sleeves + +



1. The new Willys Knight 95 sedan, a four-door, five-passenger type + +

2. Plan view of transmission, partly in section, showing the free-wheeling unit bolted to the transmission housing

3. A view of the driver's compartment and instrument board, showing the pull lever for the free-wheeling unit projecting from the dash + +

4. Sectional view of the Willys Knight 95 engine which is provided with crankcase ventilation into the induction system + + + + + + + +

may be further controlled by means of thermostatically operated inbuilt shutters, which are furnished at extra cost.

Improvements have been made also in the lubrication system of the engine. Oil enters the bearings at the side and is distributed through an oil groove extending over the lower half. It is carried around the upper half by its adherence to the journal.

All crankshaft, connecting rod and eccentric shaft bearings are of this type. At the rear end of the connecting rod bearing the babbitt is not chamfered, as heretofore, but is of uniform thickness over the whole length, which is said to give a more rigid support for the entire bearing surface.

Greater water capacity has been provided in the block around the cylinders, this having been made possible by the use of the six-ported inlet manifold. A type of crankcase ventilation has been adopted by which heated air and hydrocarbon vapors in the crankcase are drawn through the carburetor into the combustion chambers of the engine cylinders.

This not only tends to keep down crankcase dilution—the usual object of crankcase ventilation—but provides additional lubrication for the upper ends of the pistons and valve sleeves, particularly at high engine speeds, when these parts need copious lubrication most. The Float-O oil intake for the pump, which was originally adopted for Willys cars in January last, is used in this engine.

Pistons are of aluminum alloy, of the invar-strut type, but instead of two narrow supporting bars they have a single wide, heavy support. Three compression rings and one oil ring are carried by each pis-

(Turn to page 96, please)

A NEW Willys-Knight car, known as the Model 95, which is to be sold at the lowest price that a car of this make has ever been offered (base price of \$845) has been announced by the Willys-Overland Co. The chassis has the same principal dimensions as this year's Willys Six (wheel-base, tire size, etc.), while the engine is a development of a previous Willys-Knight design. The line will include four body types, a sedan, a victoria, a coach, and a coupe with rumble seat.

The engine has a bore of $2\frac{15}{16}$ in. and a stroke of $4\frac{3}{8}$ in., making the displacement 177.9 cu. in. It has a compression ratio of 5.55 to 1 and is said to develop 60 hp. at 3400 r.p.m. Four-point mounting on rubber is employed for the powerplant. This new engine differs in several respects from previous six-cylinder Knight engines. It is provided with a six-port intake manifold, the forward portion of which is shielded against cooling drafts, to prevent condensation of fuel within it. Engine temperature

JUST AMONG OURSELVES

Bureau Heads Get Publicity

"NATION'S BUSINESS" printed an anonymous blast a couple of months ago damning wholeheartedly the amount of money spent by government bureaus for dissemination of publicity and educational material, and intimating that a large proportion of such material was now being sent out for the purpose of gaining personal publicity for bureaucrats and obtaining larger appropriations for individual bureaus.

The article was intensely interesting because it exemplified superbly how an almost exactly wrong conclusion can be developed from a given set of facts by the simple procedure of setting up a distinctly one-sided viewpoint to begin with, and then applying it vigorously and persistently throughout the viewing of said facts.

Plenty of business executives do just this thing almost every day of their lives, so probably an anonymous writer isn't to be too harshly blamed for making a good story—which wouldn't otherwise have existed—by the same method.

But It's Incidental To Information

HAVING been close to the publicity releases of certain government bureaus and departments for over 10 years, however, we can't help but feel that this particular attack was shockingly unfair. That the printed matter emanating from government sources does selfishly benefit bureaus and bureaucrats isn't to be denied; but to say that this is a major

part of either its purpose or function is simply to pervert facts.

It would be futile to deny, for example, that Dr. Julius Klein's weekly broadcasts have brought to Dr. Klein much personal popularity among folks who never had heard of him before.

Basic Question Is: "Are Data Valuable?"

BUT it seems to us to be amazingly unfair to intimate that desire for this increased popularity and prestige has been any part of the reason for the starting and maintenance of these broadcasts. Only the originally prejudiced will insist that an obviously accidental relation is casual.

Take Department of Commerce material, for example. Its volume has increased in the last 10 years, to be sure. But at the same time the value, practicality, usefulness and importance of that same material have, to our certain knowledge, increased many-fold more than has the volume.

Statistical data once gathered in leisurely fashion, academically compiled and tardily released, are now brought together quickly, briskly compiled and released in time to perform their important function as a working tool for American business and industry.

Human Interest Items Stimulate Imaginations

THE same thing is true of domestic and foreign trade reports. Scientific developments still are not given enough publicity, to our mind, particularly

during the period of their growth.

Closer coordination between Bureau of Standards activities and industry's experiences and needs might well be achieved through a more regular, widespread publication and discussion of bureau activities throughout the business press of the country.

True, a certain number of inconsequential "human interest" items also emanate from the department. Why shouldn't they? They serve the very practical purpose of reminding human business men that other human beings are working down there in Washington, and encourage those business men to look forward with pleasure rather than boredom to getting to know more about those public servants in Washington.

These same items, moreover, frequently stir the imagination of the editor, send his mind running down trails not previously thought of, and occasionally perhaps lead him into otherwise undiscoverable avenues of investigation.

Let Publicity Serve American Industry!

NO, we can't see why the government bureaus should cut down on their publicity work. Nor can we see, in the material which constantly is going out to our industry, any evidences of bureaucratic ambitions overwhelming the prime business or scientific functions of the releases.

The quality as well as the quantity of material has increased definitely in the last 10 years so far as our contacts are concerned, and we're for bigger and better releases from Washington!

It's still too easy to spend a day in Washington and discover several useful, interesting services or developments about which one has failed to learn, even from a fairly careful reading of the regular department releases.—N. G. S.

Fageol Builds "All-Aluminum" Truck

Strong, Light Alloys Used for Many Chassis Parts to Increase Payload Capacity and to Reduce Unsprung Weight + + + + +

FAGEOL MOTORS CO., Oakland, Calif., has developed a motor truck of the six-wheeled type in which all parts that lend themselves to production in aluminum alloy are made of that material. The object, of course, was to reduce the weight of the truck itself and thereby gain an equal increase in payload capacity. There has been considerable development during the past year in the use of aluminum alloys for truck bodies.

The material cost, of course, is greater for aluminum, and it is obvious that if it pays to use aluminum in the body, it can be used to advantage also in the chassis, for a part of the saving in weight in the chassis is on unsprung masses, and any reduction in the weight of unsprung masses that does not result in a decrease in strength not only adds to the payload capacity, but also reduces shocks and adds to the life of tires.

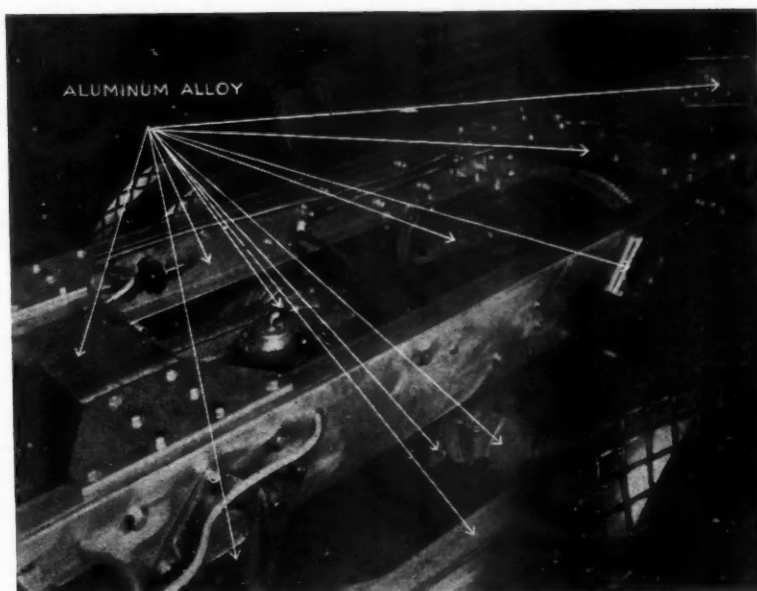
In working out the design of the parts made of aluminum alloy, the engineers of Fageol Motors enjoyed the assistance and cooperation of the Aluminum Co. of America. The design of the truck as a whole is based on a previous model in which most parts that are now made in aluminum alloy were made of steel.

These parts include the axle housing, the radius rods, the frame rails, frame brackets, etc. In designing these parts for production in aluminum alloy, the original designs were adhered to as closely as possible, because in many cases conditions of space limitation had to be met.

It is stated that in the original chassis the factor of safety of many parts was higher than actually required. However, in no case where aluminum was substituted for steel was the factor of safety decreased. The factors of safety were calculated from actual tests of the steel and malleable members, and it was found that to assure equal factors of safety with aluminum alloy it was necessary to increase the sections by an average of 50 per cent.

In the majority of cases it was possible to modify the patterns from which the steel and malleable castings had been made to make them serve for the aluminum castings.

All joints between aluminum members are made by means of heat-treated bolts, rather than by rivets, and all steel-to-aluminum joints are protected against



Aluminum alloys found wide acceptance in this Fageol chassis + + + + +

corrosion by bitumastic paint. Riveting, however, can be used for aluminum the same as for steel members, for while the upsetting of hot rivets on aluminum heats the surface of the material, the effect does not extend sufficiently deep to impair its physical properties.

Fageol Motors began this development about July 1, 1930, and the first aluminum-alloy truck was ready for testing about Oct. 1, 1930. The company put the chassis in experimental service carrying a load of steel bars weighing 22,000 lb. During these factory tests, we learn, no important defects were discovered, and the
(Turn to page 110, please)

Where Fageol Used Aluminum

Alloy Castings

Rocker Arms, Rear Axle Assembly
End and Center Axle Housings
Hub Spacers
Wheel Adapters
Rear Hubs
Drive Plates
Airbrake Chamber Brackets
Main Spring Bearings
Brake Spiders
Rocker Arms, Front Axle Assembly
Main Spring, Front Brackets
Gas Tank Support Brackets
Tow Hook Brackets
Bumper Supports
Front Engine Support Brackets
Front Spring Rear Brackets
Rear Axle Trunnion Ends
Front Spring Saddles
Cab Mounting Brackets
Radiator Parts

Alloy Structural Shapes

Main Frame Members
Rear and Center Cross Members
Cross Members, Rear of Cab
Cab Frame Angles

Alloy Plates

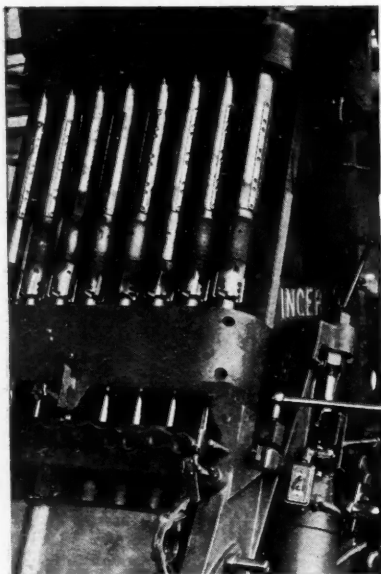
Gusset Plates
Fish Plates on Main Channel

Alloy Sheet

Hood Panels
Cab Panels
Fenders
Running Boards
Floor Boards

Aluminum Rivets

Cab
Fenders
Hood



Arc Welded Right

With welding branching out, what about inspection? Positive, non-destructive tests are demanded. Uses of X-rays and magnetic apparatus are spreading. But quick, routine methods are essential. Westinghouse bulletin No. 15, "Inspection and Test," gives some valuable dope on this. Be sure to get a copy.

Depreciation Demand Varies

Are seasonal fluctuations a factor in depreciation accounting? Yes, said C. S. Carney, vice-president, Trundle Engineering, speaking before the American Management Assn. Graduate depreciation with season. Heavy in fat times; low in lean. This would be good management, says Mr. Carney.

Reserve Executives

What is the industry doing to train future executives? Our friend John Younger asked us this one. And it isn't just curiosity. For John, as you know, is professor of industrial engineering at Ohio State. Also well known in automotive circles. This is a basic question. Potentialities of young college men could yield valuable returns through proper training. General Motors Institute doing an outstanding job. Won't you tell us about your plans?

Pressing Savings

Why finish allowance? Why extra machining? You can forget it on drop-forgings now. New, powerful presses make hot coining a

PRODUCTION LINES

dependable operation. *Maxipressing* is one method. For some purposes hot-coined forgings may be accurate enough to use without machining.

Old Turnings

We got a kick out of some old history chronicled in "English and American Machine Tool Builders," by Joseph W. Roe (McGraw-Hill, 1926). Now isn't this a wow!

It seems that in 1774 John Wilkinson invented the boring machine, and 50-in. cylinders were turned out which "Did not err the thickness of an old shilling in any part." And so was born the first feeler-gage, an old shilling. Shillings kept getting thinner and thinner, and the machining, as a result, had to be more and more accurate. Such is progress.

Keeping Pace

How, where, and why to use magnetic clutches on factory equipment. New booklet, "Keeping Pace with Machine Design," just published by Cutler-Hammer, Inc., tells you all about it. Also describes the C-H Duplex clutch.

Nailing Time

Would you like to know what your machines are doing? Idle hours, operating time, etc.? General Electric now has a meter that'll do it on any individual-drive machine. It's mainly a five-place counter driven by a Telechron clock.

Controlled Skids

Elimination of waste carries on. From the Department of Commerce comes Simplified Practice Recommendations R95-30 dealing with standardization of skid platforms. Users and manufacturers jointly have agreed on two sizes. The No. 1 skid; width not less than 32 in., not more than 33 in., length 54 in. The No. 2 skid; width 42 in., length 60 in.

Complete and Standardized

A complete line of standardized interchangeable punches, retainers, die parts, etc. Described in new

catalog edition BB, May, 1931, issued by Richard Bros. Division of the Allied Products Corp., Detroit. Complete details concerning dimensions, utilization and so forth.

More Figures

157,000 tons of lead used for automobile storage batteries in 1930. 11,000 tons for other parts. Compiled by the American Bureau of Metal Statistics. Something to shout about.

Hot Off the Griddle

T. C. Comments is a new weekly bulletin telling about latest developments in tantalum and tungsten carbide milling. By Frank Curtis of Kearney & Trecker. Here's a tip. If you mention this column we're sure you'll go on the mailing list.

Castings Improve

Virtues of electric furnace iron were extolled recently by H. E. Bromer, metallurgist, Standard Foundry Co. And justly so. One important advantage over cupola iron is improved uniformity. Also better distribution of elements. This means closer adherence to specifications. Another bull's-eye scored by Mr. Bromer was the statement that more uniform hardness is achieved. Moreover Brinell hardness comes very close to specifications. What a break for engineers and harassed foundry men.

When in Queen City

When you're in Cincinnati visit the Cincinnati Milling Machine Co. and the Cincinnati Grinders, Inc. Fred A. Geier, president, invites you to see their new demonstration departments. Batteries of grinders and milling machines set up and under power ready for you to operate. One good idea will more than repay you for the time you spend. Maybe we'll meet you there on our next trip.—J.G.



Synthetic Paraffin Oils Developed

IN a paper presented to the American Chemical Society at its recent Indianapolis meeting, four chemists of the Standard Oil Co. of Indiana (F. W. Sullivan, V. Voorhees, A. W. Neeley and R. V. Shankland) dealt with the development of a process for the production of lubricating oil by synthesis. Strangely enough, the new oils are being made from paraffin wax, which every effort is made to remove from lubricating oils produced by the present refining processes.

Present lubricating oils are complex mixtures of hydrocarbons made from the heavier portion of petroleum, after distilling off gasoline and kerosene, and then refining to remove undesirable constituents, such as dark-colored asphaltic bodies, petrolatum, wax, etc.

It is natural to suppose that some particular hydrocarbon compound or a narrow range of compounds is better for lubricating purposes than the complex mixture, and chemists of the Standard Oil Co. of Indiana have been studying this problem for several years. A study of natural oils indicated that the ideal lubricant would be made up of hydrocarbons whose molecules contained twice as many hydrogen as carbon atoms. It was also found, when making up such oils synthetically, that chain-type hydrocarbons are much superior to the ring type. In many natural oils the chain-type hydrocarbons are present, but it is impossible to separate them from the less desirable types associated with them.

The problem then arose as to how chain-type hydrocarbons could be obtained commercially on a large

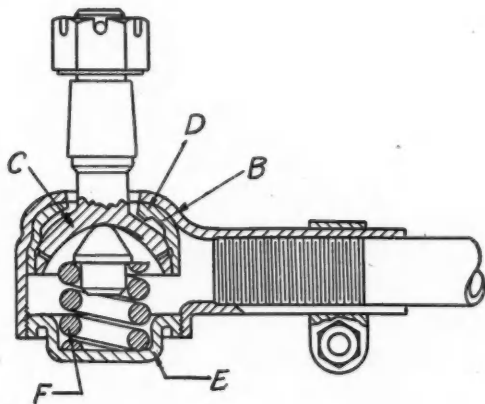
scale, and the most practical process was found to be by the polymerization of olefines, whose molecules consist of twice as many hydrogen as carbon atoms. Not all olefines are equally suitable for the purpose, however, and ethylene, for instance, which can be made from grain alcohol or from coal gas, gave an oil that proved far inferior to natural oils. The particular types of olefines that could be used were found to be rare and expensive, but a practical source of these olefines was finally found in paraffin wax. After being cracked under certain conditions, the paraffin yields the olefines needed, and polymerization of these yields a lubricating oil which is said to have superior properties.

The new oils can be made in any desired viscosity. They have a pale straw color, high resistance to oxidation and sludging, very low pour test, and low volatility. Above all, the viscosity of the new oil varies less with temperature than that of natural oils.

While the cost of the raw materials and the complicated operations involved in the manufacturing processes make these synthetic oils rather expensive, they are now being made commercially by the Standard Oil Co. of Indiana, and are said to have been found particularly well suited for many uses where requirements are unusually severe, such as the lubrication of gear shifts and shock absorbers of automobiles, and of engines of airplanes, where a minimum change in viscosity with temperature, absence of solidification at low temperatures, and maximum stability are important.

Tie Rod Designed to Reduce Shimmy

A TIE-ROD end which is claimed to eliminate or considerably reduce tendency of a car to develop shimmy, tramp, or wheel fight has been developed by William Cathcart of Detroit. The claim is based on the introduction of friction within the joint when the wheels are in a straight-ahead position, to dampen out undesired movement before they reach the steering gear.



In order not to interfere with easy steering a cam is provided in the joint which breaks the friction when the wheels are turned beyond an angle of $2\frac{1}{2}$

deg. from the straight-ahead position. This cam is shown at *D* in the drawing. When this cam is moved off the flat surface shown by turning the front wheels to right or left, it separates part *B* from part *C*, breaking the friction.

Adjustment for the required amount of friction is provided through the means of a threaded cap which supports loading spring. The remainder of the tie-rod end is of conventional design and construction.

Demonstrates Airway Beam

PROJECTION of light from a bulb only about five or six times larger than the ordinary lamp used in the home, so that a person five miles away is able to read a newspaper by its rays, has been demonstrated at Cleveland, Ohio, by W. A. Pennow, an airport and airway lighting engineer, with the Westinghouse Electric & Manufacturing Co. The light was projected from a searchlight throwing a narrow beam over Lake Erie. The beam over its course spread only 12 ft. a mile. The searchlight is designed principally to aid aviators in determining the height of cloud banks. The narrow beam makes the determination more accurate than with previous methods. The searchlight contained a 420-watt lamp.

The FORUM

Some of the most stimulating automotive engineering discussions ever held have first appeared in print in The Forum. It's your space, engineers and executives, for the discussion of your own ideas. We reserve only the right to edit. The more challenging your letter, the more chance it has for publication. Brief letters are desirable, but excellence will usually merit space

Sees Need in Fuels Development

"[F] the report in *Automotive Industries* of the recent S.A.E. meeting is sufficiently expansive to be fair to all speakers,* some criticism may be in order of the statements of some representatives of large oil companies. Apparently some of these representatives would tell engineers to build high-speed engines for the purpose of burning heavy oils; that is, these engineers are to spend time and money in order to let the oil companies follow their own sweet will.

"Let us put the shoe on the other foot. Suppose the chemist applied to the mechanical engineer for a new type of still for fuel production, and the engineer told the chemist that his request to apply distillation in refined fuel production was an exhibition of failure to use the available means at his disposal. Also, that the chemist should be able with commercial satisfaction to separate the several oil fractions merely by close application with his absorbents, his precipitators, filters and repetitive procedure. And then let the engineer refuse to listen to the chemist's explanations and pleas. Such would appear, however, to be the attitude of some oil companies toward the engine developer. Doubtless such an attitude is not based on scientific inspiration.

"There are several things wrong with the admonition to proceed with the development of high-speed—which for us means *variable*† speed—engines for the purpose of using heavy and residual fuels.

"In over ten years of widespread activity by mechanical engineers in the development of oil engines, the speed of *commercial* designs has been increased about only 1000 r.p.m. This increment is far below the expectations of those active engineers. The causes have been discovered through the hard knocks of cut-and-try methods. Scientific and instructive information from the oil industry which might have served as valuable aid to those engineers has been decidedly meager.

*We believe it was.—Ed.

†All italics in this letter follow Mr. Matthews' notation.—Ed.

"There is either an unconscious or else a willful failure to vision the involvements of the problem. So to do may be a grave and costly condition—for someone other than an oil company.

"Elimination of unnecessary drags and other opportunities for evasive influences to insert themselves is a sensible and defensible aim for engineers. The chemist can aid in this

direction. The gasoline engine dictates the minimum of requirements for a competitive type of engine. There is evidence of large efforts having been and still being made to improve gasolines. Before the slump there was in print a statement that a million dollars were to be spent in *advertising* a premium gas line. How little money has gone to advance any form of instrumentation for oil engine development!"

ROBERTSON MATTHEWS,
Consulting Engineer,
Bolton, Ontario

Spark Advance—Compression Ratio

"We have run across what appears to be a useful rule in connection with the variation of optimum spark advance with compression ratio. This rule is, briefly, that the ratio of the optimum spark advance to the clearance volume is a constant, under a given set of conditions.

"The experiments were made on a single-cylinder variable-compression engine directly connected to a dynamometer. A premium fuel was used and the throttle opened to such a point that no knocking occurred at a compression ratio of 7 and a spark advance of 20 deg. Without varying any conditions except spark advance and compression ratio, runs were made at 600 r.p.m. and at 800 r.p.m. The optimum spark advance was determined by determining the spark advance at which the beam load was a maximum. In this manner, the figures given in the table below were obtained.

"It can be seen that the agreement between the observed values and those calculated is quite good.

"The rule that optimum spark advance is directly proportional to clearance volume can easily be expressed in terms of compression ratio

when it is remembered that clearance volume is inversely proportional to the compression ratio minus one. We have then that

$$O = \frac{K}{r-1}$$

in which O is the spark advance in degrees, r is the compression ratio and K a constant, the value of which will depend on the engine, the load and speed, mixture ratio, etc.

"The results shown in the table can be expressed by means of the equation when the value of K is 89.8 for 600 r.p.m. and 112 for 800 r.p.m.

"It is interesting to note that in Fig. 16 on page 47 of this new book (*High Speed Internal Combustion Engines*), Ricardo shows a graph of optimum spark advance against compression ratio, as found with a single-cylinder research engine. Ricardo's curve is represented very accurately by means of the equation given above, when the value of K is 117."

CLARKE C. MINTER
WILLIAM J. FINN

Research Laboratory,
The Texas Co.

OPTIMUM SPARK ADVANCE AND COMPRESSION RATIO

| Compression ratio | 600 r.p.m. | | 800 r.p.m. | |
|-------------------|------------|------------|------------|------------|
| | Observed | Calculated | Observed | Calculated |
| 3.5 | 35.0 | 35.9 | 42.5 | 44.7 |
| 4.0 | 30.0 | 30.0 | 40.0 | 37.4 |
| 5.0 | 22.5 | 22.5 | 27.5 | 28.0 |
| 6.0 | 18.3 | 18.0 | 22.5 | 22.4 |
| 7.0 | 15.0 | 15.0 | 18.5 | 18.7 |

More Complete Vaporizing

IN the June 13 issue of *Automotive Industries*, A. L. Clayden commented on the shortcomings of the present carburetion systems. It is the writer's opinion that a better volumetric efficiency can only be obtained by more completely breaking up the fuel into minute particles and thoroughly enveloping it with air. An atomizer and rotatory mixer should be made part of the carbureting system through which the entire output of the carburetor is super-carbureted whether one or more carburetors are employed.

"Incomplete carburetion produces an unbalanced mixture, causing loading and choking of the engine, acceleration hesitancy, periodic vibrations due to raw fuel entering the cylinders, etc. The carburetor cannot satisfactorily be adjusted to meet the wide range of ever-changing conditions in actual service—different temperatures and varying altitudes, hot or cold engines, inexperienced drivers, abundant and incorrect use of the choke, over-accelerating, defects in the synchronization of two or more carburetors, etc. There is therefore a pressing need for a fool-

proof device to assure positively complete carburetion under all driving conditions.

"Inasmuch as the expansion of the charge drives the pistons when combustion occurs, the efficiency of such expansion controls the acceleration, power and speed. Hence for smooth and efficient operation, it is necessary to super-carburete so as to fill all cylinders equally with a balanced charge of the proper consistency and uniform expanding qualities. Balancing the charge in the combustion chambers is equally important to balancing the crankshaft, connecting rods, pistons, and all other parts mechanically.

"Rapid ignition and complete combustion resulting from super-carburetion assure the very best of economy by saving fuel, preventing oil dilution, minimizing carbon deposits, thereby keeping the spark plugs, valves and combustion chambers clean, etc. Consequently, the cost of maintenance is reduced. The smoother performance and better lubrication prolong the life of the engine and that of the entire driving mechanism."

P. J. F. BATENBURG,
Consulting Engineer,
Racine, Wis.

Sees Bright Diesel Future

THERE seems to be a recession of interest in high-speed, automotive-type Diesel engines due to the fact that prices of gasoline and fuel oil are approaching each other.

"Fuel oil can never be more expensive than gasoline. There is enough competition to keep the price of fuel oil on a sane level, and artificial price fixing cannot last for any length of time. As soon as there is a demand for fuel oil for high-speed Diesel engines, there will be the necessary supply available at a sound price. But the Diesel must be so developed as to burn efficiently the cheaper grades of fuel oil most convenient to the oil companies. It is not enough to build the Diesel at a competitive price—say, 50 per cent higher than the price of a gasoline engine of the same class. But the practical variable-speed Diesel engine that is independent of the fuel is not yet here.

"The higher the efficiency to which the Diesel engine can be developed the lower will be its fuel consumption and the less dependent it will be upon the availability of cheap fuel. With a fuel-oil price equal to that of gasoline, the high-efficiency, oil-burning engine will provide a powerplant for automotive use that will double the mileage per gallon of fuel. For instance, it will be possible to operate a 20,000-lb. bus at an average speed of 25 m.p.h. a distance of 11 to 12 miles on a gallon.

"For a transportation company

which spends a million dollars a year for gasoline, this saving means something. For such a company it would pay to replace its gasoline engines with oil-burning engines of the economy cited even if the cost of the oil engines is 100 per cent greater than that of gasoline engines in the same class, such as the new 125-150 hp. bus engines.

"A low-compression oil-burning engine, however, which has an oil consumption about same as the gasoline engine, has no chance as far as fuel economy is concerned.

"The high-speed, automotive Diesel or oil-burning engine will come when it has been properly developed."

HUGO MOREN.

Vegetable Oil Fuels

IN connection with the Colonial Exposition, which is being held in Paris this summer, demonstrations of the use of vegetable oils (produced in the French African colonies) in Diesel-type truck engines were demonstrated by runs between Paris and Fontainebleau. It is admitted that under present conditions these oils cannot be produced cheaply enough to compete with mineral fuels even in Africa, but it is said to have been shown that in case of an emergency sufficient fuel could be obtained by France from this source. Vegetable oils have been tried also as engine lubricants, but considerable difficulties are said to have been experienced be-

cause of the acid nature of these oils. Even if the acid is neutralized by chemical treatment it reappears when the oils are exposed to air and moisture.

Modern Diesel Engine Practice

By Orville Adams. Published by the Norman W. Henley Publishing Co., New York.

THIS is a book written principally for the Diesel engine operator and the Diesel sales engineer, and therefore deals primarily with large, slow-running Diesel engines. However, a chapter is devoted to Diesel aircraft engines and contains reprints of an S.A.E. paper by Col. J. G. Vincent on Types of Internal Combustion Engines and Their Fuel Requirements, an abstract of L. M. Woolson's paper on the Development of the Packard Diesel aircraft engine, a description of that engine and instructions to pilots and mechanics on the care and operation of the engine. There is also a chapter on Automotive Applications of Diesel Engines, which is confined almost entirely to the development of the Cummins Diesel engine.

A COPY has been received of Bulletin No. 9 of the Engineering Experiment Station of the University of Minnesota, entitled "Manifold Phenomena in Internal Combustion Engines," by Kalman J. DeJuhasz.

The bulletin discusses the results of tests undertaken for the purpose of collecting material for a study of the pressure phenomena attending the exhaust and intake processes in high-speed engines and also includes an evaluation of data upon which the computation of light-spring indicator cards may be based.

Psychology and Driving

Psychological Principles in Automotive Driving. By Albert P. Weiss, Ph. D., and Alvan R. Lauer, Ph. D. Published by the Ohio State University, Columbus, Ohio.

THIS bulletin is a report of a research made at the instigation of the National Research Council, at the Laboratory of Experimental Psychology of the University of Ohio, to secure fundamental information on the psychological aspects of automotive driving which could be used as a basis by the Federal Government for formulating a model set of statutes for licensing automobile drivers. The subject is dealt with from many angles.

For instance, one chapter deals with a study of several large groups of drivers in which accident records are compared with results of intelligence tests. Other chapters deal with results of psychological experimentation on subjects, and still others with analyses of certain traits of automobile drivers in relation to their accident and traffic-court records. The book should be of interest to all engaged in the promotion of safety on the highways.

Planning Buying of Machine Tools

(Continued from page 83)

9. General discussions of operating costs and overhead expenses.

One of the most significant things in the relation between the manufacturers of machine tool equipment and the users of their product is a more open-minded attitude on the matter of sales policies and service cost. This was discussed editorially by Norman G. Shidle in *Automotive Industries*, January 17, 1931*. As service and demonstration costs are placed on a sounder basis, there will be a greater stability in the profits of machine tool manufacturers, and ultimately this may be reflected favorably in the selling price of machine tools.

An outstanding example of the new idea in selling machine tools is the procedure followed by Warner & Swasey. Recently C. S. Stillwell, sales manager for this company, told the writer about their new setup based largely on the financial statement shown in Fig. 2. As an analysis of this financial statement will indicate, a complete picture is drawn of the relative merits of the old and new machines. The beauty of this method lies in its extreme simplicity. It starts with an estimated saving per piece with a new machine and ends with a statement of the profit on the investment after any given period.

Overhead accounting methods are of fundamental importance. The idea of referring overhead burden to direct labor only is no longer tenable. Many of the larger manufacturers in the automotive field are using the "burden center" method, in which each piece of equipment carries its share of all expenses within the burden center in direct proportion to the area it occupies. A fine exposition of a formal accounting procedure for burden center control is given in the recommended practice of the National Machine Tool Builders Association†. In principle the recommended

practice is to charge each machine with its share of expense in the following fashion:

1. Building expense, including light, heat, power and depreciation.
2. Equipment expense.
3. Labor.

This kind of accounting gives a true picture of operating costs.

Of course there are other things to consider. Take for example the suggestions made by several speakers at the production conference at the American Management Association. L. R. Boulware, speaking from the marketing manager's point of view, suggests that under certain conditions it may be better to put out a product with a higher material and a higher labor cost in order to get it on the market quickly. He had in mind particularly an industry in which rapid fashion changes occurred, and where it would not be feasible to invest in special tool equipment. Consequently, the decision of the sales manager often has a direct bearing on factory overhead.

10. Finally, what is the economic value of a rational replacement formula?

Let us look at it in the broad sense. Much will be accomplished if the study does nothing more than to isolate all the factors involved and to separate the judgment factors from those which may be established by calculation.

But let us look beyond this. There is a crying need for planned replacement programs—for adequate sinking funds from which production departments may get the money for new equipment which they need so much. Another thing is the general stabilizing effect of planned equipment programs on industry as a whole. If buying is more or less regularized through a knowledge of conditions, it will have a profound effect on the machine tool industry and its ability to produce equipment economically.

*Just Among Ourselves. "Is Service Free?"
†Procedure for Establishing Normal Burden Rate, Bulletin No 11. And Supplement to Bulletin 11 giving schedules.

Willys Offers 60 h. p. Knight Six

(Continued from page 89)

ton, and the piston pins are of the floating type. Connecting rods are designed to provide pressure lubrication to the piston pin bearings. The eccentric rod bushings have a thin steel back which is babbitt lined.

Provision is now made so the clutch shaft bearing can be lubricated from the outside. The diameter of the flywheel has been increased to permit of the use of a starter gear of increased pitch diameter. There are now timing openings in the flywheel housing on both sides, where formerly a single opening on top of the housing was provided.

A Tillotson carburetor of a new design and larger size is employed, and is equipped with a new type A.C. silencer, air cleaner and flame arrester. The fuel is now fed to the carburetor by a cam-operated pump.

A simplified type of free-wheeling device is available at extra cost. It is controlled by a separate lever extending back from the instrument board, between the steering post and the gearshift lever. The unit consists of a roller clutch mounted on the transmission housing at the rear, which can be rendered

operative or inoperative by means of a cable connection to the instrument board, where it is jointed to the control lever already referred to. The lever terminated in a ball of the same size as that on the gearshift lever.

Use of a double-drop frame has made it possible to place the body very low. Looked at from the front the new model closely resembles the Willys-Knight 66-D, the radiator shell design being very similar. Wire wheels are regular equipment, and two spare wheels are carried in fender wells.

Interior fittings include an arm rest on each side, a robe rail, hand grips, and a foot rail. Other features include a front seat, adjustable fore and aft, and also as to inclination, finger-tip control, an anti-glare windshield, enclosed Duo-Servo brakes, with cable control; narrow corner posts at the windshield for clear vision, concealed wiring for lamps, a hydrostatic fuel gage, a trunk rack at the rear, the radiator filler cap concealed under the hood, an all-steel rear axle housing, a tubular front axle, and drop-center rim wire wheels. Safety glass is furnished as an extra.

Mica Spark Plugs for Aircraft Favored for Larger Engines

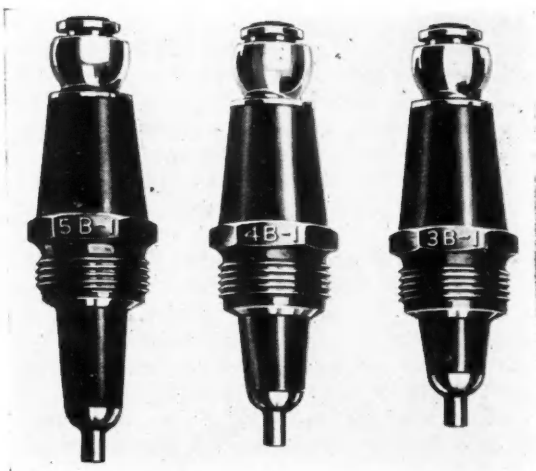


Fig. 1—Three types of B.G. Hornet mica-insulated spark plugs, heat graded

IN a paper on the above subject, presented at the recent aeronautical meeting of the S.A.E. at Detroit, the author, Geo. M. Paulson, chief engineer of the B. G. Corporation, briefly outlined the history of spark plugs for aircraft engines. He said that during the World War both mica and porcelain plugs were used extensively by the government services, mica plugs particularly in air-cooled rotary engines, and porcelain plugs in water-cooled engines. Toward the end of the war a very satisfactory mica-insulated spark plug, the Mosler M-1, was developed for the Liberty water-cooled engine. The Champion A-163 of the same period was a very satisfactory plug for the Curtiss OX5 engine. Prior to the development of these plugs it was unusual to go through a 10-hour test of an engine on the dynamometer without encountering spark plug trouble. The AC, another representative spark plug for aircraft engines of the period, was of one-piece construction, while the Mosler mica plug was of the two-piece type.

Following the close of the war, other mica plugs were developed, including the B.G. Models 1A and 1XA, which were extensively used in Liberty water-cooled engines. With the adoption of higher compression for water-cooled engines and the development of air-cooled radial engines, such as the Wright Whirlwind, it was found that mica plugs with the "cigarette" exposed to the combustion in the cylinder overheated at full throttle, causing the engine power to fall off and the mica "cigarette" to disintegrate. As a result, future development of the mica spark plugs was confined to the 1XA type, in which the cigarette is protected by mica washers. During this period the AC Type N porcelain plug was used to a considerable extent in non-military services for both air-cooled and water-cooled engines, with the exception of the Liberty.

With the advent of large-size radial air-cooled engines the mica spark plug assumed the lead, and a check-up of all aircraft participating in or visiting the last Chicago National Air Races (475 in all) showed that 75 per cent were equipped with mica spark plugs and that practically all engines of over 225 hp. carried plugs of this type.

A demand on the part of the government services for a small, light-weight plug, particularly for the inlet side of water-cooled V engines, led to the development of the B.G. Hornet series of spark plugs with a 11/16-in. hex. One advantage of this plug is the saving in weight which it represents. Eighteen of the larger size (1XA) plugs weigh approximately 66 oz., while the same number of the smaller plugs weigh 33 oz. The former have an over-all length of 2½ in., the latter of 2 in. At the present time the military services prefer the small plugs; the commercial operators, the larger one.

Mr. Paulson pointed out in his paper that mica lends itself well to use as insulating material for spark plugs, owing to its high dielectric strength, its resilience, its mechanical strength and its machining qualities. Micas are silicates varying in color from pale brown or yellow to green and black, or having no color at all. They are characterized by their perfect cleavage. In the manufacture of spark plugs the insulation is built up of sheets of clear selected mica split to about 0.00125 in. in thickness and rolled into the form of a tube or "cigarette," which is protected at top and bottom by mica washers punched from sheet mica. The dielectric strength of the plug as a whole depends solely upon the cigarette, the washers serving only to protect the cigarette against mechanical injury and against the heat of combustion.

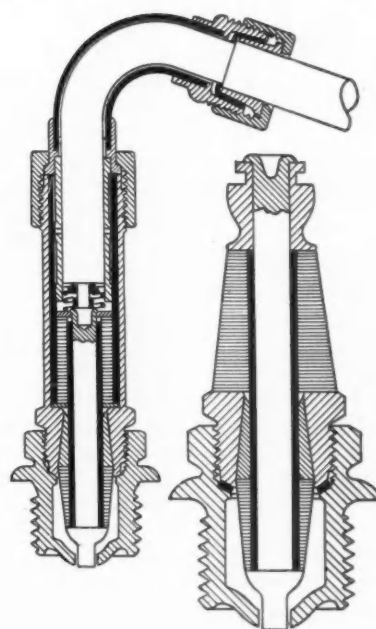


Fig. 2 (left)—Radio-shielded B.G. spark plug.

(Right)—Section of B.G. mica-insulated spark plug + + +

Owing to the high dielectric strength of mica, very little of it would suffice to give the necessary insulation if one could be sure that it would not be injured in the assembling process. But the plug must be gas-tight, and to make it so is a difficult problem. Among the methods employed to solve this problem may be mentioned the expansion of a soft metal tube inside the mica cigarette; compressing the cigarette in a cell of powdered mica formed in the bushing nut of the plug, and bulldozing a brass bushing nut about the cigarette. In the B.G. plugs a soft metal cone, through which the cigarette and spindle pass, is forced into a taper seat in the bushing nut. Any method of sealing the plug which subjects the mica cigarette to extremely high pressure is dangerous, for although the plugs may pass the laboratory tests they are likely to fail in service after 50-100 hours of engine operation under severe conditions.

Mica Core Assembled With Shellac

The built-up mica core or insulator is assembled with shellac or other binder under heavy pressure and is held together by upsetting the terminal end of the spindle. After baking, the core is formed by ordinary machining operations. The center spindle of the B.G. Hornet spark plug is made of three different materials that are electrically welded together. The machined cores are assembled in shells or bodies, and the shell electrode either is inserted through a drilled hole, crimped in, or made integral with the shell.

Mica spark plugs produced by different manufacturers differ widely in appearance and proportions. Most of these plugs will operate satisfactorily only under a limited range of engine-operating conditions. To meet various operating conditions the manufacturers generally vary the length of the mica core exposed to the cylinder gases, thus producing what are known as "hot" and "cold" plugs. A plug with a long core exposure is referred to as a hot plug, and vice versa. As in most other lines of engineering, the designer must meet two extreme conditions. High-compression, highly supercharged engines tend to burn up any spark plugs inserted in their cylinder walls, particularly when fuel distribution and cooling of the engine are faulty.

The resistance of a plug to fouling depends on two things, viz., the length of the flash-over path (that portion of the mica exposed to the cylinder gases) and the temperature at which that mica is maintained. If a plug is designed with too much mica exposure it will have good resistance to fouling, but when the engine is operated under full throttle the mica and the spindle head will become overheated, preignition of the engine will set in, and the power output of the engine will fall off. Preignition due to faulty spark plugs is very dangerous, and may result in complete engine failure, without the appearance of the spark plugs after the failure giving any clue as to what caused it. One crash in which several persons lost their lives was officially ascribed to preignition caused by hot spark plugs.

Copper spindles, copper tubes about the spindles, cooling fins on the terminal and shortening of the exposed portion of the core will eliminate the tendency to preignition, but it does not follow that any such changes will make a better spark plug, as they may cut down the resistance to fouling sufficiently to make the plug impracticable for general use. It is easy enough to make a plug that will operate satisfactorily within a narrow range, such as full-throttle operation of a particular engine, but to make a plug that is satisfactory

for general use in standard engines and which will also stand up under full-throttle operation of supercharged engines on the dynamometer is a difficult problem.

After satisfactory resistance to fouling and to preignition has been obtained, electrode life becomes the most important consideration, for it determines the life of the plug and the service expense involved in keeping the plug in operation. Nickel-manganese alloys seem to be the best electrode materials so far produced. In the older types of B.G. plugs, in which a single-shell electrode is used, the gap is adjusted every 40 or 50 hours under ordinary operating conditions. Shell electrodes are replaced two or three times during the life of the plug, of 600 to 900 hours, and considerable maintenance labor is involved. In the latest model, the B.G. Hornet, four heavy electrodes are made integral with the shell, to increase electrode life and reduce the labor required in resetting the gap. These plugs are made in three types, the 3B-1, the 4B-1 and 5B-1, with different core exposures, as shown in the illustration.

The "hottest" plug of the group, the 5B-1, is very satisfactory for winter operation in tri-motor planes, in which the engines are kept idling for long periods and do very little full-throttle work. They are also satisfactory for engines which tend to pump oil and foul the plugs. The 4B-1 is designed for general use in commercial and military planes, while the 3B-1 plug is intended for supercharged engines with very high b.m.e.p.s.

Commercials Set Gap at 0.025

In aircraft work, engine speeds seldom exceed 2500 r.p.m., and owing to propeller characteristics, the engine is not required to develop much torque at low speeds, and it is not idled for any length of time at very low speeds. The spark plug gaps can be set at 0.012-0.015 in. without interfering with proper idling. The standard width of gap for new military and commercial aircraft spark plugs is 0.015 in. It is not safe to allow the gaps to become wider than 0.031-0.032 in., although in dynamometer runs plugs with a gap of 0.040 in. will operate without trouble under full throttle.

Most commercial operators do not allow the gaps to become wider than 0.025 in. On refueling endurance flights of 500 to 600 hours without change of plugs, the plug gaps have burned to 0.035-0.040 in. without causing trouble at the reduced throttle settings at which these flights are made. The danger of large gaps lies in the loss of power which they may cause, since the resistance of the gap increases with the density of the cylinder charge. Trouble from this cause is most likely to occur when taking off, when the most engine power should be available. A plug also will foul more easily with an excessive gap.* As a rule, fouling does not occur in all of the cylinders at the same time, and an examination of a set of plugs will reveal in which cylinders the trouble resides. A plug which is dry and in which the electrodes are whitish-gray at the gap is doing its work properly. A fouled plug is easily distinguished by the appearance of the core and the electrodes. After a few hours' opera-

*What the author apparently means is that a plug will give trouble from fouling more easily if it has an excessive gap. It is hard to see how the actual fouling, that is, the deposition of conducting material on the surface of the insulator exposed to the burning gases, can be affected by the length of gap; but if the gap is longer it requires a higher voltage to break it down, and a given degree of fouling and the leakage consequent thereon will more easily prevent the attainment of this higher voltage than that of the lower voltage required to break down a shorter gap.—Editor.

tion the same trouble recurs, and the plugs again are blamed for troubles of which they show only the effects. As a rule, if engine conditions are right, modern plugs, properly selected for the engine on which they are used, give little trouble. If properly cleaned and reconditioned, the plugs will pass all of the factory tests given new plugs, and are as reliable as these. One of the large commercial operators, operating over both land and water, started out with the theory that the life of mica plugs was about 100 hours.

At the factory all new plugs are tested with current from a standard "nine-cylinder" Scintilla magneto, under an air pressure of 105 lb. p. sq. in. With a gap set to 0.015 in., most new plugs will fire at 150 lb. p. sq. in. Reconditioned plugs and any others which will fire under 80 lb. p. sq. in. air pressure will probably work satisfactorily in the average aircraft engine.

Most troubles from spark plugs seizing in spark-plug bushings are due to rough threads on the plugs, or to injuries to the plug threads in service. It takes a comparatively small injury to the plug thread to cause it to start "picking up" in the bushing. Carelessly throwing a spark plug into a tool box may have to be paid for with a new cylinder or a new spark-plug bush-

ing. As the plugs are taken from the cylinders they should be immediately placed in racks to prevent injury to them.

To prevent interference of ignition currents with radio reception, the whole ignition system, spark plugs included, is now generally shielded. Such shielding for spark plugs also should give protection against rain and oil and against exhaust gas and machine-gun fouling. The conventional unshielded plug has approximately $\frac{5}{8}$ in. surface flash-over from the terminal to the nearest grounded part of the plug, and with the shielded plug an equivalent surface flashover path must be maintained to all parts of the plug shield and wire shield. Fig. 2 is a cross-section of the B.G. radio-shielded spark plug, with connection to fit Packard No. 844 shielded cable. This plug is made in the same models as the unshielded Hornet plugs, with the same hex sizes.

Mica is the only insulating material used in this plug, the wire is held in contact in the plug by a mica sleeve and a small coiled spring, and the plug can be installed without the use of solder or special tools. An elbow is built into the terminal to prevent short-bend wear and tear which might otherwise occur on the wire-shielding.

Seiberling Triple-Tread Air-Cooled Tires

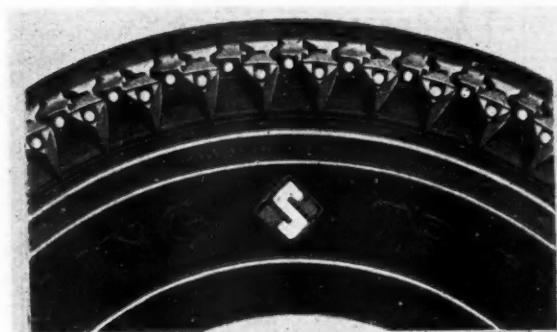
A NEW design of pneumatic tire has been placed on the market recently by the Seiberling Rubber Company, Akron, Ohio, under the name of the Seiberling triple-tread, air-cooled tire. It has a tread that is considerably thicker than that carried by the average pneumatic of today (23/32 in. instead of 10/32 in. according to the maker), and this tread is perforated transversely by circular holes at two levels. These transverse holes, of course, give an additional cushioning effect, and thus obviate some of

connection with this tire. The lower temperature at which the tread operates in consequence of this improved means of heat dispersal is claimed to result in longer life of the tire.

These tires carry the usual anti-skid formations on the tread, and in service these formations, of course, wear off. But just about the time the original anti-skid formations disappear, the tread wears through to the outermost series of transverse holes. Thus a second set of anti-skid formations comes into action, and the same process is repeated after these have worn away. Thus the tire

has practically three anti-skid treads which come into action consecutively, with the result that the anti-skid effect is maintained practically throughout the life of the tire. The construction is said to make the tire practically puncture-proof and also nearly burst-proof.

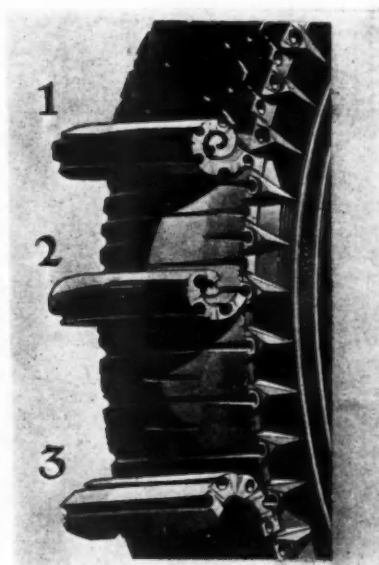
It is expected that at the beginning the tire will sell particularly in the high-class car and the truck fields. Seiberling bought the Lambert patents and developed the Lambert designs by using a triple instead of a dual tread construction, with the object of increasing the mileage, anti-skid quality and resilience of the originally planned product.



Seiberling triple-tread tire + + +

the difficulties met with in previous attempts to increase tire life by adding to the thickness of the tread, which resulted from too great stiffness of the tread.

At the point where the tire tread comes into contact with the road surface the tread is compressed, which causes the holes to close up partly, thus forcing the air out of them. As this same portion of the tread passes out of contact with the road, it assumes its normal shape again, and the holes fill with air. Thus there is a sort of breathing action of the tread, that helps to carry off the heat generated by the flexing of the tire structure, which is the basis for the use of the term "air-cooled" in



Showing the three superposed treads + + +

Automotive Oddities—By Pete Keenan

THE GRAND NATIONAL BANK, ST. LOUIS, PROVIDES A PRIVATE DRIVE AND SPECIAL TELLERS FOR AUTOISTS.

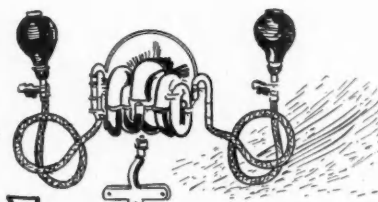


JAMES L. ECK.
of Reading, Pa.
BUILT 22 AUTOMOBILES. ALL
BY HIS OWN LABOR.



THE CHINESE EMPEROR SHUN 2258. B.C.
IS THE FIRST MAN IN HUMAN HISTORY TO ACTUALLY FLY A SELF POWERED FLYING MACHINE.

A HUMAN TRAFFIC LIGHT
THIS SET OF RED AND GREEN LIGHTS WORN BY A TRAFFIC COP IN NORFOLK, VIRGINIA.



FRENCH JERICO HORN 1906
CONSTRUCTED SO THAT IT COULD BE OPERATED BY THE CHAUFFEUR AND PASSENGER, AT THE SAME TIME.



NEWS

OF THE INDUSTRY



Schwab Buys Back Interest in Stutz

With Associates Controls 70% of Stock

INDIANAPOLIS, July 16—Charles M. Schwab, who was for many years the largest stockholder and director of the Stutz Motor Car Co., and who sold his interests when he resigned from the directorate, has recently purchased a large interest in the Stutz company. He is again the largest Stutz stockholder, he and his associates controlling approximately 70 per cent of the common stock of the company.

Last week Mr. Schwab visited the factory of the Stutz company to inspect the plant and confer with the management.

N.A.C.C. Directors Meet in Detroit

DETROIT, July 16—A meeting of the directors of the National Automobile Chamber of Commerce was held yesterday at the Detroit Country Club following the return of John V. Lawrence, N.A.C.C. European representative, at which motor transport development and automobile trade conditions in Europe and the Near East were discussed.

"Despite unsettled conditions in some countries, motor vehicle sales have held up well during the first half of the year, and while there was some decrease in passenger car sales this was offset by increased business in commercial vehicles," said Mr. Lawrence. Increased use of motor vehicles, particularly buses and trucks, is noted in all these countries, particularly Near Eastern, where the public is largely dependent on the automobile for transportation. With the return of more settled conditions this growth should further increase. Campaigns for educating the public to the use of motor vehicles for transportation have been carried out by the N.A.C.C. and International Permanent Bureau of Automobile Manufacturers.

LOUIS GERB of the (French) Citroen organization arrived in this country on the S. S. Paris, Wednesday the fifteenth . . . object unknown at time of writing * * * did you know that ANCO ten-edge windshield wiper blades are used in practically every Rolls-Royce automobile in circulation in England? . . . the Anderson Co. of Gary, Ind., craves to have you know that . . . including the fact that the Royal Family cars are so equipped, and that the British War Office has adopted them . . . for service in Ypres? * * * the East Jefferson Ave., Detroit, plant of U. S. Rubber has established a cafeteria for office employees, ten stories above the street . . . M. A. Clark, the company's industrial relations manager, got the big idea, and the company bought some big umbrellas and the sort of little tables you see along the Parisian sidewalks . . . there's a radio and everything and the boys and girls voted it a big success * * * Chrysler Corp. is the only automobile manufacturer to have an exhibit at the American Fair now in progress at Atlantic City, and which continues to Aug. 26 . . . Chrysler is exhibiting 22 units from its lines, and there are 25 attendants at the space * * * De Vaux will not introduce any new models before the end of this year, according to an announcement from the factory . . . some body types will be added to the present line, however * * * the new Stutz DV-32 which was put into production a week or two ago, is being announced to the public in a rather spectacular fashion, which somewhat varies the present tendency to send a car or two hurtling back and forth across the continent . . . three squadrons of cars, each led by one of the modern series of "Bearcats," are touring, each squadron in charge of a Stutz official . . . each squadron is called a "flying circus" . . . squadron commanders are Bert Dingley, C. Alfred Campbell and Robert C. Wallace * * * a big 12-foot Goodyear tire, which has just completed a 12,000 mile trip through 24 states, has returned to the factory, and has been mounted on a permanent display stand . . . a small electric motor revolves it, while searchlight beams illuminate it . . . requires 45 min. to inflate the darned thing to a pressure of 3 lb./sq. in. and the tube weighs 125 lb. . . glorifying tyres, what? * * * the miniature Napoleonic coaches which a lot of laddies throughout the country submitted for the Fisher Body Corp.'s prizes are being judged. . . Michigan entries are exhibited in the Detroit Institute of Art, and prizes of \$300 will be awarded for skill in judging them * * * springs on the new Plymouth are being made by the Standard Steel Spring Co. * * * indications are that Kaye Don, the big British racing driver, raised the ante on his marine speed record.—H. H.

THE
NEWS
TRAILER

Standard of Indiana Changes Policy

Will No Longer Furnish Equipment to Retailers

CHICAGO, July 14—Effective Aug. 1, the Standard Oil Co. of Indiana will discontinue installing, loaning, or leasing service station equipment to resellers.

Officials explained that under competitive conditions it has become customary for oil companies or other wholesalers to provide to retailers most of the equipment needed for dispensing gasoline or servicing motor cars. This practice has long been regarded in the oil industry as unsound economically in that it has encouraged multiplicity of outlets far beyond consumer needs, with consequent waste in marketing costs.

The Indiana company's discontinuance of the practice, officials said, is undertaken in an effort to put its wholesale business on a basis of straight commodity selling. The new policy will become permanent, they said, if the competitive situation permits.

Vauxhall Expects Profit

NEW YORK, July 16—General Motors Export officials pointed out in connection with statement of Vauxhall loss for 1930 that not only was there practically no loss during the last eight months of that year, but every month so far this year has shown a consistent profit, and the company confidently expects to continue to operate at a profit for the rest of this year.

Diamond T Sales Up

CHICAGO, July 16—Sales of Diamond T trucks last month showed an increase of 25 per cent over June, 1930, E. J. Bush, vice-president, Diamond T Motor Car Co., announces. Sales in first six months were 20 per cent below corresponding period last year, but Mr. Bush expects the second half to register 50 per cent gain over first.

Men of the Industry and What They Are Doing

Fokker Plans New Company

NEW YORK, July 15—Anthony H. G. Fokker has resigned as consulting engineer of Fokker Aircraft Corp., a subsidiary of General Aviation Corp., in order to develop plans which he has had under consideration for some time. Mr. Fokker, however, remains a large stockholder and a director of General Aviation Corp., which is controlled largely by General Motors Corp.

Mr. Fokker plans to organize a holding company which will control and coordinate the activities of the various foreign companies operating under license on his patents. The holding company will be international in its scope and will own majority stock in the various foreign licensees and will coordinate the engineering development and sales work of these various companies.

Where, as in most European countries, the aeronautical industry is subsidized largely by the government, the military work carried on in the Fokker plants will continue to be largely under government supervision. The commercial work, however, together with the engineering developments, will be controlled largely by the holding company.

Mr. Fokker has regained from General Aviation the use of the Fokker name for the American market and plans to erect a plant somewhere within the metropolitan area for the development and manufacture of new Fokker designs. General Aviation will manufacture and sell under the Fokker name such airplanes as were on order at the time of the resignation of Mr. Fokker.

Satchell Talks to Canadian Unit

E. T. Satchell, president of the Motor & Equipment Association, spoke today before the Canadian M.E.A. in Ottawa. He will also speak next week at the meeting of the Southern Automotive Jobbers Association to be held in Asheville, N. C., July 20 to 22.

Bestor Leaves Chrysler

Frank C. Bestor, formerly in charge of dealer operations at Dodge Brothers, has resigned from the central staff of the Chrysler Corp. in which dealer operations of the various units were merged some time ago.

Opens Aeronautical Exhibit

NEW YORK, July 15—New York Museum of Science and Industry has opened up an aeronautical division as a part of its transportation section. This exhibit is designed to show four phases of the aeronautical industry; namely, educational, historical, tech-

nological and sociological and economic. The exhibit is made up largely of specimens of parts and equipment, going into the manufacture of a plane and its engine together with apparatus which will clarify the elements of aerodynamics.

It is the thought behind this portion of the Museum, as it is in the structure of the whole Museum, to present graphically the processes and theories involved in modern industry together with the processes of development to both the lay mind and to the technologist in the field covered. To this end much of the material exhibited is shown in such form as to interest the average individual, the high school student and the technical student. Also various forms of essential parts of the finished machine are shown for comparison by the engineer and technologist.

The historical part of the exhibit shows models of various developments within the industry together with pictures of equipment used in historical flights.

Refinery Operations Studied by Bureau

WASHINGTON, July 16—There were 435 completed petroleum refineries in this country on Jan. 1, 1931, according to a survey made by the United States Bureau of Mines, Department of Commerce. This figure compares with 412 refineries on Jan. 1, 1930. The number of refineries reached its peak in 1923 and 1924, after which there was a more or less steady decline until 1930, when the number of plants constructed considerably exceeded the number dismantled.

The total capacity of all refineries on Jan. 1, 1931, amounted to 3,987,685 barrels, of which 3,706,610 barrels, or 93 per cent, represents the capacity of the operating plants; 236,075 barrels, or 6 per cent, represents the capacity of the inoperative plants, and 45,000 barrels, or 1 per cent, represents the capacity of 10 plants under construction. These data as compared with Jan. 1, 1930, represent increases in capacity as follows: For total capacity, 5 per cent; for the capacity of operating plants, 2 per cent; for inoperative plants, 81 per cent and for plants under construction 21 per cent.

The total survey of the operating plants has increased steadily since the first complete survey of refineries was made as of Jan. 1, 1920, states G. R. Hopkins and E. W. Cochrane in a report recently issued by the Bureau of Mines. During the 10-year period, 1921-1931, the capacity of the operating plants increased 107 per cent. When it is considered that during this

Automotive Stocks Recover With July

Complete Unit Producers Showed Firmest Trend

NEW YORK, July 16—Automotive stocks as of July 1 showed a strong recovery on the whole over the earlier 1931 trend of dropping prices which forced the average figure from \$28.39 as of March 1 to \$20.58 of as June 1.

The July 1 average recovered nearly three points to 23.45, according to the current bulletin of the New York Stock Exchange.

Car and truck company stocks showed a sharper recovery than did the stocks in the accessory group. The former recovered from \$22.49 as of June 1, to \$25.56 as of July 1.

The total market value of common and preferred stocks of the 59 automotive concerns, including 35 car and truck company issues, was \$2,713,339,051 as of July 1, compared with \$2,411,012,586 as of the previous month, a gain of over \$300,000,000 for the month.

The figures given in the monthly bulletin show the following comparisons:

| Average Common Stock Prices | | | |
|-----------------------------|-------------------------|---------------------|------------------|
| | Car and Truck Companies | Accessory Companies | Total Automotive |
| March .. | \$30.06 | \$22.01 | \$28.39 |
| April .. | 28.92 | 20.92 | 27.25 |
| May .. | 27.05 | 17.07 | 24.97 |
| June .. | 22.49 | 13.39 | 20.58 |
| July ... | 25.56 | 15.15 | 23.45 |

The number of automotive company common and preferred shares listed as of July 1 was slightly less than the March 1 figure.

Gabriel Reports Loss

NEW YORK, July 15—Gabriel Co. reports net loss for the three months ending June 30 of \$7,903. This compares with a loss for the corresponding first quarter of last year of \$30,508, and with earnings for the three months immediately preceding of \$8,201, or 4 cents a share on combined Class A and B stocks.

same period the production of crude increased 102 per cent, it would not appear that there had been an over-expansion in refining facilities. However, when gasoline production is compared with refinery growth, it becomes evident that the refining capacity has grown more rapidly than the consumption of refined products. The potential capacity of the refineries to produce gasoline has increased several fold in the last 10 years, even outstripping the rapid increase in demand for this product. This has made it necessary for most refineries to curtail their operations, and there are very few plants which have operated at capacity for any length of time within the last year or two.

Rim Inspections Drop Sharply

Shift From Balloon to Drop-Center Types Nearly Universal

NEW YORK, July 16—During the first six months of 1931, 1,640,249 rims for balloon tires were inspected by the Tire and Rim Association, Inc., as compared with 7,550,313 during the year 1930. Although the comparison is not between similar periods, it indicates a very large drop. This is due to the fact that there was a very pronounced shift from the regular balloon type rim to the drop-center type during the past year.

Whereas the balloon-tire rims inspected in 1930 constituted 43.3 per cent of all of rims inspected, during the first six months of 1931 the balloon rims constituted only 19.7 per cent of the total. Drop-center rims to the number of 4,930,125 were inspected during the first half of the current year, as compared with 6,302,110 during the whole of 1930, the percentage of this type having increased from 36.2 to 59.8.

The table shown herewith, taken from the Tire and Rim Association's report for July 1, 1931, gives the numbers of rims of each size of the balloon and drop-center types inspected during the years 1929 and 1930 and the first six months of the current year, and therefore gives indications of the growth and decline in popularity of the various sizes.

It may be pointed out in this connection that the semi-drop, base-split type, which is made in four sizes only, also has gained in popularity, rims of this type inspected during the first half of 1931 having constituted 1.9 per cent of the total, as compared with 0.8 per cent during the year 1930.

Spain Reduces Tariff

WASHINGTON, July 14—The establishment of a special program reducing the duties on automotive vehicles imported unassembled for completion with elements from Spanish industry is provided for by a government decree published in the *Gaceta de Madrid* of July 4, according to a radiogram received in the Department of Commerce.

It is announced that this plan is designed to assist the development of Spanish automotive construction in progressive stages, by first encouraging assembly using foreign parts, but on a systematic plan leading to the eventual use entirely of Spanish parts.

Leo Heintz

Leo Heintz, president of the Heintz Mfg. Co., Philadelphia, died July 8, it is stated in an announcement from the officers and directors of the company.

Summary of Rim Inspections 1929, 1930 and 6 Mos. of 1931

| Size | 1929 | | 1930 | | 1931 (6 mo.) | |
|--------------------|-------------------|-------------|------------------|-------------|------------------|-------------|
| | Number | Pct. | Number | Pct. | Number | Pct. |
| BALLOON | | | | | | |
| 17 x 3.25..... | ..... | ..... | 7,747 | 0.0 | 25,659 | 0.3 |
| 17 x 4..... | ..... | ..... | 1,008 | 0.0 | 82,902 | 1.0 |
| 17 x 4½..... | ..... | ..... | 15,592 | 0.1 | 140,035 | 1.7 |
| 17 x 5..... | ..... | ..... | 9,188 | 0.1 | 7,188 | 0.1 |
| 18 x 3.00..... | ..... | ..... | 231 | 0.0 | 316 | 0.0 |
| 18 x 3.25..... | 117,424 | 0.5 | 119,319 | 0.7 | 118,711 | 1.4 |
| 18 x 3½..... | ..... | ..... | 868 | 0.0 | ..... | ..... |
| 18 x 4..... | 1,343,576 | 5.6 | 1,008,872 | 5.8 | 191,330 | 2.3 |
| 18 x 4½..... | 304,324 | 1.2 | 126,599 | 0.7 | 20,051 | 0.2 |
| 18 x 5..... | 112,545 | 0.4 | 82,911 | 0.5 | 39,387 | 0.5 |
| 18 x 6..... | ..... | ..... | 16,745 | 0.1 | 18,783 | 0.2 |
| 19 x 2.75..... | 782,616 | 3.3 | 2,430,685 | 14.0 | 89,595 | 1.1 |
| 19 x 3.00..... | ..... | ..... | 640,859 | 3.7 | 85,632 | 1.0 |
| 19 x 3.25..... | 330,558 | 1.4 | 25,923 | 0.1 | 2,244 | 0.0 |
| 19 x 3½..... | 586,287 | 2.4 | 189,166 | 1.1 | 3,060 | 0.0 |
| 19 x 4..... | 4,181,327 | 17.3 | 1,550,741 | 8.9 | 389,003 | 4.7 |
| 19 x 4½..... | 966,487 | 4.0 | 560,400 | 3.2 | 235,619 | 2.1 |
| 19 x 5..... | 220,666 | 0.9 | 138,435 | 0.8 | 54,356 | 0.7 |
| 19 x 6..... | ..... | ..... | 6,067 | 0.0 | ..... | ..... |
| 20 x 2.75..... | 5,263,579 | 21.8 | 32,500 | 0.2 | 33,697 | 0.4 |
| 20 x 3½..... | 73,341 | 0.3 | 58,688 | 0.3 | 9,443 | 0.1 |
| 20 x 4..... | 1,592,295 | 6.6 | 133,501 | 0.8 | 18,003 | 0.2 |
| 20 x 4½..... | 359,804 | 1.5 | 119,189 | 0.7 | 9,432 | 0.1 |
| 20 x 5..... | 234,176 | 1.0 | 16,622 | 0.1 | 14,248 | 0.2 |
| 20 x 6..... | 37,625 | 0.1 | 2,406 | 0.0 | 335 | 0.0 |
| 21 x 2.75..... | 164,855 | 0.7 | 1,847 | 0.0 | 1,023 | 0.0 |
| 21 x 3½..... | 405,607 | 1.7 | 180,516 | 1.0 | 31,029 | 0.4 |
| 21 x 4..... | 67,689 | 0.3 | 26,365 | 0.2 | 7,251 | 0.1 |
| 21 x 4½..... | 65,594 | 0.3 | 37,615 | 0.2 | 8,021 | 0.1 |
| 21 x 5..... | 6,527 | 0.0 | 1,966 | 0.0 | 2,009 | 0.0 |
| 21 x 6..... | 3,668 | 0.0 | 5,373 | 0.0 | 1,734 | 0.0 |
| 22 x 3½..... | 170 | 0.0 | 1,358 | 0.0 | ..... | ..... |
| 22 x 4..... | 1,469 | 0.0 | ..... | ..... | 153 | 0.0 |
| 22 x 4½..... | 2,251 | 0.0 | 1,011 | 0.0 | ..... | ..... |
| Total | 17,224,460 | 71.3 | 7,550,313 | 43.3 | 1,640,249 | 19.7 |
| DROP CENTER | | | | | | |
| 16 x 3.62 F..... | ..... | ..... | 19 | 0.0 | ..... | ..... |
| 17 x 3.25 E..... | ..... | ..... | 22 | 0.0 | 7,283 | 0.1 |
| 17 x 3.62 F..... | ..... | ..... | 29 | 0.0 | 216 | 0.0 |
| 18 x 2.15 B..... | 28,947 | 0.1 | 67,715 | 0.4 | 16,447 | 0.2 |
| 18 x 3.00 D..... | ..... | ..... | 83 | 0.0 | ..... | ..... |
| 18 x 3.25 E..... | ..... | ..... | 25,641 | 0.1 | 322,091 | 3.0 |
| 19 x 2.15 B..... | 23,322 | 0.1 | 32,273 | 0.2 | 5,461 | 0.1 |
| 19 x 2.75 D..... | ..... | ..... | 39,622 | 0.2 | 5,880 | 0.0 |
| 19 x 3.00 D..... | 195,693 | 0.8 | 6,114,088 | 35.2 | 4,479,450 | 54.0 |
| 19 x 3.25 E..... | ..... | ..... | 3,885 | 0.0 | 65,887 | 0.8 |
| 19 x 4.00 F..... | ..... | ..... | 8,141 | 0.0 | 29,410 | 0.4 |
| 20 x 2.15 B..... | 1,712 | 0.0 | ..... | ..... | ..... | ..... |
| 20 x 4.00 F..... | 20,846 | 0.1 | 10,592 | 0.1 | ..... | ..... |
| 21 x 2.75 D..... | 1,785,100 | 7.4 | ..... | ..... | ..... | ..... |
| Total | 2,055,620 | 8.5 | 6,302,110 | 36.2 | 4,930,125 | 59.7 |

Morse Chain Sales Gain

ITHACA, N. Y., July 17—Sales of the second quarter just ended by the Morse Chain Co., division of Borg-Warner Corp., were 19 per cent above those of the previous three months, it was announced today by C. S. Davis, president of the parent corporation.

Rubber Consumption Holds

NEW YORK, July 15—Consumption of crude rubber by manufacturers in the United States for the month of June is estimated to have reached 37,916 long tons, showing practically no change as compared with May, which is counter to the usual seasonal decrease of 5 per cent experienced in previous years, according to the Rubber Manufacturers Association. Consumption for June, 1931, is 10.9 per cent over June, 1930.

Imports of crude rubber for June amounted to 45,776 long tons, an increase of 44.3 per cent over the May figure of 31,720 long tons, and 7.3 per cent over June, 1930.

The association estimates total domestic stocks of crude rubber on hand June 30 at 225,536 long tons, an increase of 2.1 per cent over May, and

48.8 per cent over June 30, 1930.

Crude rubber afloat for the United States ports on June 30 is estimated at 69,421 long tons, as against 73,560 long tons on May 31 and 58,658 long tons on June 30, 1930.

Dodge Adds School Buses

DETROIT, July 15—Dodge Brothers announce the addition of two new units to their line of school buses, one to be known as Model 185 and the other Model 187.

The Model 185 sells for \$1,760 f.o.b. Detroit, and will seat 30 to 56 pupils. It is available with four different seating arrangements.

This new unit has a wheelbase of 165 in., and can be had with either four or six-cylinder engine. The price quoted above is for the four-cylinder model. It has an overall length of 275 in., overall width of 92 in. and an inside height of 66 in.

The Model 185, with six-cylinder, 66-hp. engine, sells for \$1,860 to \$1,960. Overall body dimensions of this unit are the same as in the four-cylinder model.

The other new model, No. 187, has a wheelbase of 190 in.

New Car Financing Exceeds May, 1930

Retail Paper for the Month Held Up in Volume and Frequency

WASHINGTON, July 15—Wholesale financing of passenger car sales reached a volume of \$72,567,312 during the month of May, according to the regular monthly compilation by the Bureau of the Census. Of the 278,540 units included in the transactions, 45.56 per cent were new cars, 51.38 per cent used cars, and 3.06 per cent unclassified. The wholesale volume for the month compares with a volume of \$83,659,772 for the month of May, 1930, which included financing of 294,729 units.

Retail financing for the month of May this year reached a total volume of \$109,557,247 on 278,540 units, according to the preliminary figures. This was an average of \$393 per car, and marks a slight increase over the month of April, when the average was \$389 per car. In May of 1930 the average per car was \$391.

The total volume of May retail financing compares with a volume of \$115,383,435 reached in May of 1930 on 294,729 units.

New cars financed at retail in May of the current year numbered 126,898, with a total volume of 68,637,836, an average of \$541 per car, as compared with an April average of \$529. In May, 1930, 115,740 new cars were financed at retail, with a volume reaching \$68,278,083, an average of \$590 per car.

Waukesha Takes F. & J. Line

WAUKESHA, WIS., July 13—A portion of the line of 15-hp. gasoline engines developed by the defunct Fuller & Johnson Mfg. Co., Madison, Wis., has been taken over and placed in production by the Waukesha Motor Co., a leading manufacturer of motor truck, bus and industrial engines, it is an-

nounced by H. L. Horning, president. Until now the smallest engine built by Waukesha was of 20-hp. rating. The 15-hp. engine has a wide application both in industry and agriculture. Already more than 800 engines have been manufactured. The total production schedule of Waukesha for July is 4000 engines of all its lines. June was the first month to show a gain over corresponding month of 1930, and July business so far indicates another increase.

Moock Addresses Md. Dealers

OCEAN CITY, N. J., July 13—"We are as far removed from the saturation point in the automobile industry today as we were in 1901," said Harry G. Moock, general sales manager of Plymouth Motor Corp., speaking before the Maryland State Automobile Dealers Association here today.

Speaking on the subject, "Automobile Retailing—What's It All About," the Plymouth sales head encouraged more than 500 motor car dealers from Maryland, Delaware and the District of Columbia by stating that all signs pointed to an early upturn in the automotive industry.

Develops Supercharged "Hornet"

EAST HARTFORD, CONN., July 15—A new supercharged Hornet engine, manufactured by the Pratt & Whitney Aircraft Co., recently completed its type test at the Naval Aircraft Factory in Philadelphia. The new engine, which is intended primarily for military bombing planes, is a development of the Series B Hornet, from which it differs principally in having a supercharger and a 3:2 reduction gear for the propeller. It maintains the normal output of 575 hp. of the Series B up to an altitude of 8000 ft., and is capable of an output of 775 hp. at sea level. It is said to be the largest air-cooled engine now in production in this country.

Factories Set Vacation Plans

A Number of Detroit Plants Will Shut Down

DETROIT, July 14—A check of a number of major automobile and parts manufacturers in the Detroit area indicates that a considerable number of factories will be closed down for "vacation periods" through the end of July and early part of August.

Factories which will close down from July 19 to Aug. 1 include Cadillac Motor Car Co., Continental Motors and Timken-Detroit Axle.

Oakland Motor Car Co. is scheduled to shut down for vacation period July 25 to Aug. 8.

Graham-Paige factory vacation is scheduled for Aug. 3 to Aug. 17. Olds Motor Works is also contemplating a two-week vacation for factory employees although dates have not been fixed as yet.

Chevrolet, Buick, Dodge, Plymouth-De Soto, Hudson, Hupp and Packard factories will not be closed for vacation periods, according to present plans.

Among the parts companies considerable uncertainty regarding possible shut-downs exists at present, especially with those companies supplying materials and parts to the Ford Motor Co. July commitments from this company to parts manufacturers, the latter state, were issued as definitely cancellable at any time.

So far, cancellations have not materialized extensively, although the general assumption at present is that Ford will be closed for a minimum of one month and possibly six weeks. June production of the Ford Motor Co. aggregated 78,000 units approximately, according to the most reliable information available, and July schedules if anything are below this figure. A shut-down by Ford Motor Co. would necessarily be accompanied by a virtual closing down of the factories of such companies as Briggs and Murray.

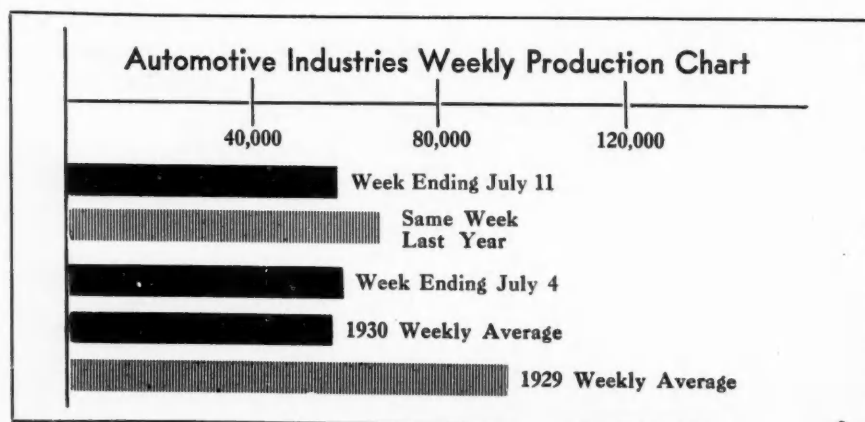
No plans for a shut-down have as yet been made by Bohn Aluminum and Motor Products.

Detroit Gear Improves

CHICAGO, July 15—Business volume of the Detroit Gear & Machine Co., division of Borg-Warner Corp., for the six months just ended is slightly above the comparable period of last year and 178 per cent more than the last six months of 1930.

Leipsic Fair Dates Set

NEW YORK, July 15—The 1931 Leipsic Trade Fair will be held Aug. 30 to Sept. 3.



July 18, 1931

Automotive Industries

Aero Licenses Gain in All Groups

Each Classification Shows Increase Since First of Year

WASHINGTON, July 15—There were 16,268 pilots, 7458 aircraft and 9222 mechanics holding active Department of Commerce licenses on July 1, 1931, according to the results of a study just completed by the aeronautics branch of the Department of Commerce. In making this announcement today, Colonel Clarence M. Young, Assistant Secretary of Commerce for Aeronautics, said there had been a growth in each of these classifications since the beginning of the calendar year, when there were 15,280 licensed pilots, 7354 licensed aircraft and 8993 licensed mechanics.

The total number of aircraft, licensed and unlicensed, of which the branch had record on July 1, was 10,235, as compared with 9818 on Jan. 1, 1931. Unlicensed craft (bearing identification numbers only) numbered 2777 on the first of July, as against 2464 on the first of January.

Among the 16,268 persons holding pilots' licenses as of July 1, there were 6532 of the transport grade, 1741 limited commercial licenses, 67 industrial pilots and 7928 licensed in the private classification. The licensed pilots included 445 women, whose licenses were divided as follows: Transport, 34; limited commercial, 53; industrial, 2, and private, 356. The 9222 mechanics included 5 women.

Leading the states in number of aircraft, licensed and unlicensed, was New York, with 1190. California was second with 1160, and Illinois third with 685. Considering licensed aircraft only, California led with 974; New York followed with 965, and Illinois was third with 472. The greatest number of unlicensed aircraft was in New York, where there were 225, while Illinois had the next greatest number, 213, and California was third with 186.

In number of licensed pilots, California led with 3092, New York was second with 1658 and Illinois third with 1031. California also led in number of licensed mechanics with 1674, followed by New York with 883, and with Illinois' total of 561, third.

The study also included gliders and glider pilots. It was found that the number of licensed gliders was 100, and unlicensed gliders 1107, making a total of 1207. Licensed glider pilots numbered 238. The greatest number of gliders in a single state was in California, where there were 257. Michigan was second with 121 and New York third with 119. California also led in number of licensed glider pilots with 98, while New York had 36 and Michigan 24.

Status of Aircraft, Gliders, Pilots, Glider Pilots and Mechanics by States, as of July 1, 1931

| | Aircraft | | | Pilots | | | | | | | Total | Glider Pilots | Mechanics |
|---------------------|----------|------------|-------|-----------|-----------|------------|---------|-------|---------------|-----------|--------|---------------|-----------|
| | Licensed | Unlicensed | Total | Transport | Ltd. Com. | Industrial | Private | Total | Glider Pilots | Mechanics | | | |
| Ala. | 32 | 31 | 63 | 2 | 42 | 3 | 40 | 85 | 1 | 53 | | | |
| Ariz. | 39 | 9 | 48 | 3 | 22 | 12 | 65 | 99 | 0 | 41 | | | |
| Ark. | 48 | 21 | 69 | 0 | 37 | 12 | 71 | 122 | 0 | 61 | | | |
| Calif. | 974 | 186 | 1,160 | 257 | 1,104 | 229 | 1,736 | 3,092 | 98 | 1,674 | | | |
| Colo. | 52 | 31 | 83 | 93 | 60 | 25 | 61 | 146 | 0 | 80 | | | |
| Conn. | 115 | 28 | 143 | 12 | 64 | 27 | 95 | 186 | 0 | 135 | | | |
| Del. | 56 | 14 | 70 | 3 | 13 | 3 | 13 | 29 | 0 | 20 | | | |
| Dist. of Col. | 77 | 5 | 82 | 9 | 196 | 8 | 59 | 263 | 5 | 148 | | | |
| Fla. | 117 | 61 | 178 | 11 | 162 | 26 | 131 | 320 | 0 | 286 | | | |
| Ga. | 38 | 48 | 86 | 1 | 42 | 8 | 30 | 80 | 0 | 48 | | | |
| Idaho | 22 | 8 | 30 | 6 | 21 | 10 | 21 | 52 | 0 | 24 | | | |
| Ill. | 472 | 213 | 685 | 71 | 407 | 119 | 500 | 1,031 | 17 | 561 | | | |
| Ind. | 177 | 95 | 272 | 30 | 110 | 49 | 158 | 318 | 3 | 148 | | | |
| Iowa | 138 | 63 | 201 | 21 | 103 | 38 | 157 | 298 | 4 | 143 | | | |
| Kans. | 180 | 153 | 333 | 54 | 113 | 30 | 102 | 245 | 2 | 196 | | | |
| Ky. | 39 | 20 | 59 | 2 | 47 | 13 | 31 | 91 | 0 | 46 | | | |
| La. | 78 | 19 | 97 | 2 | 48 | 8 | 38 | 96 | 0 | 67 | | | |
| Maine | 33 | 21 | 54 | 1 | 30 | 6 | 35 | 71 | 0 | 25 | | | |
| Md. | 73 | 20 | 93 | 9 | 54 | 19 | 74 | 147 | 0 | 116 | | | |
| Mass. | 198 | 43 | 241 | 22 | 147 | 52 | 260 | 459 | 2 | 212 | | | |
| Mich. | 394 | 123 | 517 | 121 | 310 | 85 | 410 | 805 | 24 | 453 | | | |
| Minn. | 114 | 77 | 191 | 23 | 113 | 45 | 111 | 269 | 2 | 136 | | | |
| Miss. | 31 | 12 | 43 | 1 | 18 | 6 | 28 | 53 | 0 | 20 | | | |
| Mo. | 229 | 113 | 342 | 10 | 238 | 56 | 392 | 489 | 2 | 276 | | | |
| Mont. | 33 | 31 | 64 | 1 | 30 | 13 | 46 | 89 | 0 | 55 | | | |
| Neb. | 160 | 62 | 222 | 8 | 89 | 21 | 127 | 237 | 1 | 124 | | | |
| Nev. | 14 | 3 | 17 | 2 | 7 | 3 | 10 | 21 | 0 | 22 | | | |
| N. H. | 25 | 4 | 29 | 5 | 10 | 13 | 30 | 53 | 5 | 23 | | | |
| N. J. | 193 | 118 | 311 | 38 | 141 | 39 | 245 | 426 | 7 | 305 | | | |
| N. M. | 21 | 5 | 26 | 1 | 19 | 4 | 25 | 48 | 0 | 18 | | | |
| N. Y. | 965 | 225 | 1,190 | 119 | 562 | 180 | 906 | 1,658 | 36 | 883 | | | |
| N. C. | 61 | 49 | 110 | 5 | 33 | 17 | 45 | 95 | 2 | 49 | | | |
| N. D. | 38 | 36 | 74 | 3 | 32 | 7 | 27 | 66 | 0 | 30 | | | |
| Ohio | 435 | 176 | 611 | 104 | 350 | 118 | 382 | 850 | 12 | 515 | | | |
| Okl. | 245 | 101 | 346 | 12 | 208 | 42 | 356 | 409 | 0 | 160 | | | |
| Ore. | 80 | 58 | 138 | 10 | 67 | 22 | 101 | 190 | 1 | 110 | | | |
| Penna. | 414 | 95 | 509 | 39 | 259 | 139 | 475 | 880 | 5 | 405 | | | |
| R. I. | 29 | 7 | 36 | 1 | 15 | 5 | 40 | 60 | 0 | 24 | | | |
| S. C. | 19 | 25 | 45 | 2 | 22 | 4 | 22 | 48 | 0 | 22 | | | |
| S. D. | 50 | 18 | 68 | 11 | 38 | 15 | 54 | 107 | 0 | 50 | | | |
| Tenn. | 75 | 37 | 112 | 6 | 57 | 13 | 75 | 145 | 3 | 74 | | | |
| Tex. | 338 | 113 | 451 | 16 | 441 | 52 | 297 | 793 | 2 | 406 | | | |
| Utah | 32 | 9 | 41 | 7 | 45 | 5 | 15 | 65 | 0 | 66 | | | |
| Vt. | 18 | 3 | 21 | 1 | 11 | 8 | 19 | 29 | 1 | 14 | | | |
| Va. | 56 | 16 | 72 | 6 | 132 | 16 | 51 | 200 | 0 | 274 | | | |
| Wash. | 129 | 44 | 173 | 15 | 133 | 48 | 142 | 324 | 0 | 188 | | | |
| W. Va. | 40 | 17 | 57 | 4 | 19 | 13 | 35 | 67 | 0 | 29 | | | |
| Wis. | 182 | 81 | 273 | 22 | 112 | 44 | 140 | 297 | 3 | 103 | | | |
| Wyo. | 51 | 11 | 62 | 3 | 28 | 4 | 19 | 51 | 0 | 67 | | | |
| Alaska | 16 | 5 | 21 | 0 | 16 | 1 | 2 | 20 | 0 | 17 | | | |
| Canada ¹ | 0 | 0 | 0 | 0 | 9 | 0 | 5 | 14 | 0 | 10 | | | |
| C. Z. | 0 | 0 | 0 | 1 | 50 | 4 | 5 | 57 | 0 | 70 | | | |
| T. H. | 7 | 1 | 8 | 0 | 48 | 2 | 11 | 61 | 0 | 100 | | | |
| Mex. ¹ | 0 | 0 | 0 | 0 | 11 | 0 | 4 | 15 | 0 | 7 | | | |
| P. I. | 3 | 1 | 4 | 0 | 10 | 0 | 0 | 10 | 0 | 5 | | | |
| Foreign | 3 | 1 | 4 | 0 | 27 | 0 | 10 | 37 | 0 | 28 | | | |
| Misc. ¹ | 3 | 1 | 4 | 0 | 27 | 0 | 10 | 37 | 0 | 28 | | | |
| Percentages | | | | | | | | | | | | | |
| 7,458 | | | | 2,777 | 10,235 | 1,207 | 6,532 | 1,741 | 67 | 7,928 | 16,268 | 238 | 9,222 |
| | | | | 40.2% | 10.7% | .4% | 48.7% | 100% | | | | | |

¹Figures for these countries mean airmen and aircraft licensed by the United States, but located in foreign countries.

²This figure includes 100 licensed gliders and 1107 unlicensed gliders.

³This figure includes 445 women pilots—34 Transport, 53 Limited Commercial, 2 Industrial and 356 Private.

⁴This figure includes 5 women mechanics.

David E. Ross Elected

CHICAGO, July 13—David E. Ross, Purdue University benefactor and president of its board of trustees, has been elected president of the Ross Gear and Tool Co. to succeed Edward A. Ross, late president of the concern, who died suddenly in London, England. David E. Ross was formerly vice-president and general manager of the concern, retiring four years ago to give his time to Purdue research work. He is the inventor of the Ross gear patents.

Heil Gets Army Order

MILWAUKEE, July 13—The Heil Co., manufacturer of tank and dump bodies, hydraulic hoists and other motor truck equipment, has received an or-

der from the United States Army for 38 special units for trucks to be used in refueling airplanes at federal airports throughout the country.

June Employment Dropped

DETROIT, July 15—Employment in the automobile industry in Michigan as of June 15 totaled 189,386 as compared with 202,047 in May and 237,864 in June last year, according to report from the state department of labor and industry based on reports of 73 companies. The aggregate weekly payroll was \$5,269,073 against \$6,355,121 in May and \$7,521,179 in June last year. Average weekly earnings per capita were \$27.82 in June, \$31.45 in May and \$31.62 in June, 1930.

Hearings on Rail Rate Increases Begin; I. C. C. Institutes Management Survey

By L. W. Moffett

WASHINGTON, July 16—The effect of motor transportation on the revenues of rail carriers is expected to be brought out in the hearing begun here yesterday on the plea of the railroads for a general 15 per cent rate increase. No statement, however, has been given out by the carriers as to the part motor transportation will play in the proceeding.

Inasmuch as the carriers at the opening hearing emphasized economies and improved efficiency which they say have been applied in rail transportation during the past decade in a futile effort to make a fair return on capital investment, it is assumed they will turn to motor and such other forms of competitive transportation as have been factors in the condition of the railroads today. It remains to be seen whether they will make any suggestions to meet the competition aside from increased freight rates, an alternative which in some quarters will operate in direct opposition to the purposes desired since it is claimed motor transportation would benefit by increased rail rates while the rail carriers would suffer a loss of traffic and therefore of revenue.

The emphasis placed on economy and efficiency in rail transportation was taken as a partial reply to claims made that it is because of wasteful transportation and inefficient movements that the carriers are suffering from a dangerously low return on investment. The Interstate Commerce Commission this week instituted an inquiry in management efficiency of the railroads, which is taken to be significant in view of criticism of the

railroads, which executives say is wholly unjustified.

The main witness at the opening hearing regarding economies and improved efficiency of the railroads were Dr. Julius H. Parmelee, director, Bureau of Railway Economics, and R. H. Ashton, president, American Railway Association.

The session attracted the largest attendance ever present at an Interstate Commerce Commission hearing. The large hearing room was jammed to overflowing all day, railroad representatives, shippers' representatives, and many others from all sections of the country enduring the sweltering weather to hear the firing of the opening gun by the railroads.

The Interstate Commerce Commissioners in charge are Meyer, Lewis and Lee, assisted by Examiners Disque, Hosmer and Mattingly. Sitting with them are several state commissioners.

Speculation as to the outcome of the case is of no value. It is rife, however, and of all kinds. It can be only a guess also as to when the case will be disposed of, though perhaps the general view is that a decision may be reached by Dec. 1 and if any increases are granted they will become effective by the New Year.

The present hearing perhaps will last a week or 10 days, according to existing opinion. The next hearing will be in Washington on Aug. 31 when shippers will present their case and railroad witnesses will be cross-examined. Limited hearings then will be held in other cities after which the case will be subject to examiner reports and argument before decision is made.

Hudson Sales Increase

DETROIT, July 13—Hudson and Essex sales for the last weeks in June reflected an upward trend which was continued into July, when sales for the week ending July 4 showed a substantial increase over the previous week and a decided increase over the same period a year ago, according to Chester G. Abbott, merchandising director of the company.

So far as the labor situation is concerned, Hudson will not shut down this month and any increased schedule will be taken care of by the forces now employed.

Pennsylvania Refiners Combine

NEW YORK, July 15—Nineteen oil refining companies of Pennsylvania have merged to form the Quaker State Oil Refining Corporation. The purpose of this merger is to place under one management refineries and marketing companies which have been producing various refined oil products

made from Pennsylvania grade crude oil. The new company will issue 900,000 shares of capital stock of no par value. Present owners of stock in participating companies will exchange their stock for shares in the new company. No new financing is contemplated.

The company will have its headquarters at Oil City, Pa. The officers are H. J. Crawford, president; Samuel Messer and James D. Berry, vice-presidents; W. R. Reitz, secretary and asst. treasurer, and Charles D. Berry, treasurer and asst. secretary.

Flxible Orders Increase

DETROIT, July 13—Motor coach orders received by the Flxible Company, Loudonville, Ohio, during June increased 25.7 per cent over any previous month in the history of the company, according to a statement issued by H. H. Young, general manager. This increase is based on total orders for Flxible Buick-powered buses and Flxible ambulances and funeral cars on chassis by Buick.

Steel Market Marks Time

Price Situation Not at
Point Where Trend
Can Be Positively Stated

By William Crawford Hirsch

NEW YORK, July 16—The steel market is marking time. Rolling mills are operating at close to 40 per cent of capacity, and it is thought that toward the end of the month it will be possible to revise the operating rate slightly upward. The fate of recent price advances still hangs in the balance.

Some business is reported to have been booked for hot-rolled strip steel at the \$1-per-ton advance, but the extent of these commitments has not been such as to qualify as a dependable market test. The situation in sheets is unchanged, automotive consumers still having material due them at old prices, so that fresh third-quarter buying is held in abeyance.

Takings of cold-finished steel bars and automotive alloy steels are running light. It is generally felt, however, that a somewhat more active demand from automotive consumers overhangs the market and will probably make itself felt late this month. Some are so optimistic as to hope for a bulge in buying by parts makers during the late summer.

This week's dullness was generally characterized as seasonally normal and no different from what it is ordinarily in mid-July. In fact, the present rate of operations at most mills is looked upon as rather favorable.

The leading interest's unfilled tonnage statement, showing a decrease of 141,129 tons in June, is generally accepted as denoting generally unchanged conditions in the industry. Last year July bookings were sufficient to result in a gain in unfilled tonnage at the end of that month, and there are those who look for a repetition this year, although in 1929 July, August and September showed a diminishing backlog, and October was the first month during which gains were recorded.

Pig Iron—Some of the markets are fairly active while buying in others is very light. Reports of price-shading here and there meet with denials on the part of blast furnace representatives. Quotably the market is unchanged.

Aluminum—Dull and unchanged.

Copper—The market early this week had receded to 7½ cents, delivered Connecticut, and 7½, delivered Middle West, statistical developments as well as the situation in Germany, one of the American copper industry's best customers, being untoward influences.

Tin—Straits tin sold on Monday at 25.10 cents, about midway between the year's high and low points.

Lead—Quiet.

Zinc—News that the foreign zinc cartel was reestablished at a conference at Brussels caused a firmer undertone of the local market, the foreign producers having decided to curtail production to the extent of about 100,000 tons a year and to hold accumulations for better prices.

Business in Brief

Written by the Guaranty Trust Co., New York, exclusively for Automotive Industries

NEW YORK, July 15—Despite the many unfavorable reports of business activity last week, there is an undercurrent of greater confidence noticeable in some quarters. However, there has been no improvement in general business, with the possible exception of a very slight upturn in wholesale and jobbing lines. Commodity markets have drifted downward with the recession in the stock market.

DEPARTMENT STORE SALES

The index of department store sales for June, as compiled by the Federal Reserve Board, stood at 96, as against 97 for May and 106 for April. Aggregate department store sales during the first half of this year were 3 per cent below the value of those a year ago.

CHAIN STORE SALES

Sales of 33 store chains during June totaled \$133,694,184, as against \$131,387,001 a year ago. Sales of three mail order houses during June amounted to \$52,415,360, as against \$58,696,781.

COMMERCIAL FAILURES

The number of commercial failures during June, according to Bradstreet's, was the lowest for any month this year. A part of this decrease, however, is attributed to the usual seasonal decline. The number of June failures was 6.9 per cent above that a year ago.

CAR LOADINGS

Railway freight loadings during the week ended June 27 totaled 759,290 cars, which marks an increase of 20,174 cars above those during the preceding week, but a decrease of 177,400 cars below those a year ago and a decrease of 337,279 cars below those two years ago.

CRUDE OIL OUTPUT

Average daily crude oil production for the week ended July 4 amounted to 2,482,500 barrels, as against 2,441,950 barrels for the preceding week and 2,581,500 barrels a year ago.

FISHER'S INDEX

Professor Fisher's index of wholesale commodity prices for the week ended July 11 stood at 70.4, as against 70.6 the week before and 70.3 two weeks before.

BANK DEBITS

Bank debits to individual accounts outside of New York City during the week ended July 8 were 11 per cent below those a year ago.

STOCK MARKET

The stock market last week was under pressure; and, despite some rallying tendencies, most issues closed the week with net losses. While the uncertainty of the outcome of the negotiations regarding the moratorium on reparations and international debts was undoubtedly the leading factor in the course of the stock market, some unfavorable domestic business reports also had an influence on prices.

BROKERS' LOANS

Brokers' loans in New York City during the week ended July 8 declined \$24,000,000. This decrease follows an increase of \$73,000,000 in the preceding week, which in turn followed ten consecutive weeks of decreased loans aggregating \$443,000,000.

RESERVE STATEMENT

The consolidated statement of the Federal Reserve banks for the week ended July 8 showed increases of \$12,000,000 in holdings of discounted bills and of \$5,000,000 in holdings of Government securities. Holdings of bills bought in the open market declined \$11,000,000. The reserve ratio on July 8 was 84.2 per cent, as against 84.4 per cent a week earlier and 84.1 per cent two weeks earlier.

Auburn Automobile Company Statement

Comparative Consolidated Profit and Loss Statement for the Period March 1, 1931, to May 31, 1931, Comprising Second Quarter for the Company and Its Subsidiaries

| | 1930 | 1931 |
|---|-----------------|-----------------|
| Sales—Net | \$10,495,197.00 | \$19,847,984.00 |
| Cost of Sales, excluding Depreciation | 8,218,286.00 | 15,621,914.00 |
| Gross Profit | 2,276,911.00 | 4,226,070.00 |
| Administrative and Selling Expense | 1,167,848.00 | 1,418,906.00 |
| Other Income | 1,109,063.00 | 2,807,164.00 |
| Depreciation | 1,172,168.00 | 2,926,855.00 |
| Other Expense | 951,598.00 | 2,790,828.00 |
| Net Profit before Federal Income Tax | 849,496.00 | 2,758,026.00 |
| Provision for Federal Income Tax | 107,459.00 | 247,089.00 |
| Proportion of Net Profit or Loss of Subsidiary Companies Applicable to Minority Common Stockholders | 742,037.00 | 2,510,937.00 |
| Consolidated Net Profit | 27,348.00 | 352,172.00 |
| May 31, 1931—195,234 Shares | 769,385.00 | 2,158,765.00 |
| Outstanding—Per Share | \$3.94 | \$11.06 |

Army Awards Contracts

NEW YORK, July 15—Keystone Aircraft Corp., division of Curtiss-Wright Corp., has received an Army contract for 64 bombers, 39 to be powered with Wright Cyclone engines and 25 with Pratt & Whitney Hornets. The total contract price is \$1,920,510.

Curtiss Airplane & Motor Co. has been awarded a contract for 30 O-1G observation planes and 10 O-39 observation planes.

Wright Aeronautical Corp. has received an Army contract for 100 Prestone-cooled Conquerors and 156 Cyclone engines.

Willys Takes Chicago Outlet

CHICAGO, July 13—Effective July 1 Thomas J. Hay, Inc., ceased to be distributors for Willys-Overland for the Chicago territory, and the wholesale distribution of cars is now being handled direct by the factory organization at 19 West Nineteenth St. Mr. Hay is aiding in making the change and so far has not revealed his plans. Mr. Hay is one of Chicago's auto row pioneers, having been in business there 26 years. He is a past president of both Chicago Automobile Trade Association and the National Automobile Dealers Association.

Graham Shifts Two

W. L. Kessinger, service manager of the Graham-Paige Motors Corp. since 1927, has been appointed purchasing agent, as assistant to Thomas Bradley, director of purchases, to fill the vacancy caused by the death of J. M. Kinzie.

William V. DeGalan, who has been manager of the merchandising division of the service department, has been advanced to the position of service manager.

Mr. Kessinger has been associated

with the three Graham brothers since August, 1918, when he joined their truck company at Evansville, Ind., as service manager. From March, 1920, to October, 1922, he served as purchasing agent, and when the truck company moved to Detroit he was made service manager. Shortly after the Grahams acquired the Paige-Detroit company in 1927, he rejoined them and has been service manager since November, 1927.

Mr. DeGalan entered the service department of the Paige-Detroit Company in 1911, and has remained in the service department ever since. For the last 10 years he has been manager of the merchandising division. Mr. DeGalan planned the layout of the Graham-Paige service building. In his new capacity he will have supervision over the parts, technical and claims divisions.

Modernizes Used Cars

DETROIT, July 13—Modernized used cars, equipped with the latest free-wheeling drive, are made available to the public through the decision of the Graham-Paige Motors Corp. to supply dealers everywhere with Graham improved free-wheeling units for installation in older models.

The company plans to furnish free-wheeling units immediately at but little additional cost, according to an announcement.

Graham Names Macey

Announcement has been made by C. W. Matheson, general sales manager of the Graham-Paige Motors Corp., that R. Ward Macey has been appointed Atlanta district manager for both Graham motor cars and Paige commercial cars. Previous to joining the Graham factory organization, he was Atlanta district manager for Dodge Brothers.

Motorcycle Census Shows World Gain

**Increase of 5 Per Cent
in Number of Machines
in Use at End of 1930**

WASHINGTON, July 14—The number of motorcycles registered throughout the world at the close of 1930 reached a total of 2,750,578 units, 5 per cent more than the 1929 figure, 2,625,200, but considerably below the proportionate increases that occurred during the years 1925 to 1929 inclusive and hovered around the 12 per cent mark; this period reflected somewhat a stabilization in world motorcycle markets, manufacturers being in a position closely to gage the demand for any current year and to regulate their output, according to an article by Ernest D. Cavanaugh of the Automotive Division, Department of Commerce, appearing in the July 13 issue of *Commerce Reports*.

All were prepared for the lessened demand during 1930; still, relatively speaking, it was not so great as might have been expected.

Drop in U. S. Registrations

In the United States the motorcycle has, during recent years, faced strong competition from the motor car. Motorcycles continue popular in sports and render outstanding service in police organizations and in delivery systems, but they are restricted in numbers by the competing automobile. At the end of 1929 approximately 119,400 two and three-wheel machines were in operation, which number by the end of the following year fell to about 110,750, a decrease of slightly more than 7 per cent. Canada, on the other hand, increased its registrations 7 per cent.

In Latin America the number registered at the end of 1930 totaled 11,519, an increase of about 3 per cent over the figure for the previous year. Here, as in the United States, automobile transportation is well developed and the motorcycle seems to be at a considerable disadvantage.

Motorcycles are used to a considerable extent in Oceania, but the number registered at the close of the year under review decreased to 121,430 from a total of 128,071 the previous year, approximately 5 per cent. A very slight decrease also occurred in the figures covering Asia. The increase in Africa amounted to slightly more than 1 per cent, the total number at the end of 1930 being 62,674 as compared with 61,891.

Approximately 2,363,650 machines were operating in Europe at the close of 1930, an increase of about 6.2 per cent over the previous year's figure—2,224,656. Transportation conditions in this Continent are so favorable to this type of vehicle that nearly 86 per

Motorcycle Registrations by Continents

| Continent | 1926 | 1927 | 1928 | 1929 | 1930 | 1931 |
|---------------|-----------|-----------|-----------|-----------|-----------|-----------|
| America | 162,653 | 151,617 | 140,847 | 139,386 | 139,359 | 131,799 |
| Africa | 36,698 | 49,393 | 52,499 | 62,977 | 61,891 | 62,674 |
| Asia | 44,303 | 50,098 | 53,839 | 61,929 | 71,223 | 71,025 |
| Europe | 1,087,900 | 1,320,601 | 1,577,167 | 1,877,899 | 2,224,656 | 2,363,650 |
| Oceania | 163,593 | 103,011 | 119,951 | 122,107 | 128,071 | 121,430 |
| Total .. | 1,435,147 | 1,674,720 | 1,944,303 | 2,264,298 | 2,625,200 | 2,750,578 |

cent of total world registrations operate there. There is a large demand for machines of low cost, which demand European producers have been highly successful in supplying; they are manufacturing small, low-power units at a cost considerably below that of the lowest-price automobiles. Moreover, Europeans have long been accustomed to the motorcycle and popular interest seems to be steadily increasing.

The United Kingdom leads the world in registrations, accounting for some 734,000 units, but is closely followed by Germany with 725,000 and France with 427,000; the United States comes fourth with 110,750, and Italy fifth with 105,500. The United Kingdom did not increase appreciably its fleet of motorcycles during 1930, but Germany showed an increase of 11.5 per cent, France of 5 per cent, and Italy of 31 per cent.

With Europe accounting for 85.9 per cent of the motorcycles operating throughout the world, the remainder operate as follows: 4.4 per cent in Oceania, 4.37 per cent in North America, 2.28 in Africa, 2.6 per cent in Asia and .42 per cent in Latin America.

Aircraft Companies Merge

NEW YORK, July 13—American Eagle Lincoln Aircraft Corp. has been organized to take over the business and assets of the American Eagle Aircraft Corp. and to secure a controlling stock of the Lincoln Aircraft Corp. by offering an opportunity for exchange of stock to Lincoln stockholders. The new company has an authorized capitalization of \$500,000 shares, no par value.

For the present, the company plans to operate both the American Eagle plant at Fairfax Airport, Kansas City, Kan., and the Lincoln plant, at Lincoln, Neb.

The two companies possess 15 Department of Commerce approved type certificates and will concentrate their manufacturing efforts on three types of planes, namely, the American Eagle, the Lincoln PT (primary trainer) and Lincoln AP (all purpose). These planes will rate within a price range from \$1,485 to \$4,395. The company has also purchased and plans to go into production on the Lincoln Rocket engine, formerly the Wright-Moorehouse engine.

Officers are Victor N. Roos, president, treasurer and general manager; W. D. Williams, vice-president, and Erwin Rohlf, secretary.

Bearings Standards Discussed in Europe

Committee No. 4 of the International Standards Association (anti-friction bearings) met in Copenhagen, Denmark, on May 13. Twelve countries (including the United States) were represented by thirty delegates. A proposal of the French delegation to change standard bores and outside diameters to correspond to standard international screw-thread diameters, did not meet with a favorable reception and was referred to a sub-committee. It would mean a complete change in the present series of sizes.

Swiss Make Proposal

Another proposal, made by Switzerland and supported by France, to the effect that the tolerances on bores and outside diameters should correspond to the ISA system of fits and tolerances, also met with considerable opposition, which was based mainly upon the fact that the present tolerances are recognized internationally. It was therefore decided to defer action on the proposal, and Germany and Sweden expressed their willingness to look into the proposal further as soon as ISA committee No. 3 (fits) has completed its work. The French delegation made a formal declaration that it could not agree to any international standard for anti-friction bearings which did not agree with the present French standard and the ISA fits.

Aside from the reservation of France mentioned in the foregoing, agreements were reached at the meeting regarding outside dimensions, corner radii, tolerances, inspection method for tolerances, and run-out of radial bearings. There was also general agreement regarding standards for single thrust bearings.

No Agreement on Conical Bearings

No agreement was reached on the subject of conical roller bearings. A proposal had been worked out by the secretary of the ISA, but a counter-proposal was made by the representative of the Timken Roller Bearing Co. and was supported by the British delegate. This differed from the ISA proposal in that for the larger sizes the outer diameter is smaller relative to the bore, while the length is greater. The proposal made by the Timken representative was considered of importance and will be thoroughly investigated, according to a report of the meeting.

Foreign Motor Vehicle Stocks Reported

The information supplied is based upon cabled estimates of stocks of motor vehicles on hand received each month from leading foreign offices of the Bureau of Foreign and Domestic

Commerce. The estimate refers to the stock position as of the end of the month named at the top of this sheet. Every care is used in the preparation of the estimates which are made

after careful investigation in the various foreign markets and based upon information obtained from the most reliable sources.

| Country | PASSENGER CARS | | | | USED CARS | | TRUCKS AND BUSES | | | |
|----------------------------|--|-------|---------------|-------|-------------|-------|------------------|-------|----------------|-------|
| | Low Priced | | Medium Priced | | High Priced | | Heavy Capacity | | Light Capacity | |
| | U. S. | Other | U. S. | Other | U. S. | Other | U. S. | Other | U. S. | Other |
| Cuba..... | N | N | N | .... | H | .... | N | .... | N | .... |
| Mexico..... | L | N | UL | .... | L | .... | N | .... | N | .... |
| Colombia..... | N | N | N | L | H | None | N | L | N | None |
| Panama..... | SL | N | SL | N | N | N | L | N | N | N |
| Chile..... | N | N | N | N | H | N | L | N | L | N |
| Peru..... | All automotive stocks normal. | | | | | | | | | |
| Argentina..... | N | SL | N | N | N | N | SL | H | N | N |
| Brasil..... | Stocks high—Estimated 5 months supply on hand. | | | | | | | | | |
| Uruguay..... | N | N | UL | UL | UL | L | UL | L | N | L |
| Denmark..... | N | N | N | N | N | UH | L | N | N | N |
| Norway..... | H | H | N | N | L | UL | N | L | N | L |
| Sweden..... | SH | N | N | SH | SH | .... | N | SH | SH | .... |
| Finland..... | UH | SH | N | .... | .... | .... | UL | .... | SH | .... |
| Belgium..... | N | N | UL | L | L | .... | L | L | N | L |
| Netherlands..... | N | N | SH | N | N | H | N | N | N | N |
| France..... | N | N | N | N | N | UH | N | None | N | N |
| Germany..... | L | H | L | H | N | H | N | None | N | N |
| England..... | N | N | N | N | N | N | N | None | N | N |
| Portugal..... | N | N | N | N | N | N | N | N | N | N |
| Czechoslovakia..... | UL | N | N | SH | N | N | N | N | N | N |
| Hungary..... | N | N | N | N | N | SH | N | N | N | N |
| Jugoslavia..... | N | N | N | N | N | H | N | N | N | N |
| Greece..... | N | N | L | L | N | N | N | N | N | N |
| Switzerland..... | SL | N | SL | N | N | UL | N | None | N | N |
| Poland..... | SL | N | N | N | N | L | N | N | N | N |
| Rumania..... | N | N | N | N | L | L | N | L | N | UL |
| Turkey..... | All automotive stocks unusually low. | | | | | | | | | |
| Egypt..... | N | N | L | L | L | N | N | L | N | L |
| Gold Coast..... | N | N | N | N | N | SH | N | SH | N | N |
| Union of South Africa..... | N | N | N | N | UL | UL | N | N | N | N |
| Japan..... | UL | SH | UH | N | N | .... | N | N | UL | N |
| British Malaya..... | N | SH | N | N | N | UH | N | N | N | N |
| Siam..... | N | N | N | N | N | None | N | N | N | N |
| India..... | New car stocks normal. | | | | | | | | | |
| Australia..... | N | N | N | N | UH | N | N | N | N | N |
| New Zealand..... | N | N | N | N | N | N | N | N | N | N |
| Philippine Islands..... | N | N | N | N | N | N | N | N | N | N |
| China..... | Stocks for all China considered below normal. | | | | | | | | | |

NOTE: U—unusually. S—Seasonally. N—Normal. H—High. L—Low.

Tax Refund Possible

NEW YORK, July 13—Refund claims based on the belief that motor sales to states or municipalities are exempt from excise taxes, if rejected within the past two years, can be reopened on the basis of a decision recently handed down by the United States Supreme Court. This decision was made in a case brought by the Indian Motorcycle Co. covering motorcycles sold direct by the manufacturer to state and municipal and holds that such sales are exempt from the excise tax. Under the statute of limitation, a refund is barred unless suit is brought within two years after rejection of the claim. If time will not permit the reopening of the claim, manufacturers can file suit in the Court of Claims in order to prevent the statute of limitation from taking effect and then stipulate a closing with the Treasury Department and the Department of Commerce based on the aforesaid decision.

Announces Racing Dates

WASHINGTON, July 14—A list of automobile racing dates for Pacific coast tracks has been announced by T. E. Allen, secretary of the Contest Board of the American Automobile Association. The list covers the remainder of the 1931 season. New one-mile banked dirt tracks are being constructed at Sacramento and Oakland, according to the announcement, and are expected to be ready for the dates

indicated on the schedule. Night racing cards will be in effect at the Ascot track until autumn weather necessitates a change back to daytime racing. The complete schedule follows:

| July | October |
|------------------|------------------|
| 22. Legion Ascot | 7. Legion Ascot |
| 29. Legion Ascot | 11. San Jose |
| | 14. Legion Ascot |
| August | 18. Oakland |
| 2. Legion Ascot | 25. Legion Ascot |
| 12. Legion Ascot | November |
| 16. San Jose | 1. Bakersfield |
| 19. Legion Ascot | 8. Legion Ascot |
| 26. Legion Ascot | 11. Oakland |
| 29. Pismo Beach | 15. Phoenix |
| 30. Pismo Beach | 22. Legion Ascot |
| September | 22. Sacramento |
| 2. Legion Ascot | 26. El Centro |
| 6. San Jose | 29. San Jose |
| 9. Legion Ascot | December |
| 13. Sacramento | 6. Legion Ascot |
| 16. Legion Ascot | 13. Sacramento |
| 20. Fresno | 20. Legion Ascot |
| 23. Legion Ascot | 27. San Jose |
| 27. Oakland | January |
| October | 1. Oakland |
| 4. Sacramento | 30. Legion Ascot |

Ethyl Adds Laboratory

NEW YORK, July 13—Ethyl Gasoline Corporation is erecting a new laboratory at Baton Rouge, La., which will be completed in about three weeks. The company already has two knock testing laboratories in Detroit, one in Kansas City, Mo., one in Tulsa, Okla., and one in Yonkers, N. Y.

Allis Lists New Shares

NEW YORK, July 13—The Allis-Chalmers Mfg. Co. has secured permission to list of the New York Stock Exchange 178,178 shares for the consummation of its merger arrangements with the Advance-Rumely Corp.

Amends British Code

In consideration of the fact that steam-driven trucks must carry greater weight of fuel and water than gasoline-engined trucks of the same load rating, the British Minister of Transport has issued an amendment to the motor vehicle regulations which places the gross weight limit on such trucks at 14 tons if they are registered previous to Jan. 1, 1932, and at 13 tons if registered thereafter, instead of 12 tons, which now applies to all kinds of trucks. The change, however, applies only to steam trucks which cannot exceed 12 m.p.h. with or without trailer.

Rose Joins Homs

NEW YORK, July 13—Stanley H. Rose, formerly special agent and export trade adviser of the Bureau of Foreign and Domestic Commerce, has become associated with Pablo Homs, Inc., export manager for the Lycoming Mfg. Co. and other American manufacturers.

Mr. Rose was for over eight years foreign sales manager of the General Asphalt Co., Philadelphia, and lately president of the American Safan Corp. of New York.

Goodrich Men Confer

AKRON, July 13—District advertising managers of the B. F. Goodrich Co. were in Akron July 13, 14 and 15 for a conference.

Fageol Offers Aluminum Truck

Strong Alloys Used Throughout New Model, Tabulation Shows

(Continued from page 91)

truck was then put in regular use by a local concern, in whose service it has now covered approximately 37,000 miles.

The aluminum-alloy chassis has a load capacity of 10 tons, and while the same factor of safety as that of the steel chassis was maintained, the weight was reduced 2900 lb. Of this saving 960 lb. is unsprung weight. It is stated that the reduction in unsprung weight was quite evident in the steering and the general handling of the vehicle, and the view is expressed that it will have a direct bearing on tire life.

From the saving in weight, which permits of an equal increase in the payload, the commercial advantage of the use of aluminum alloy in the construction of the chassis can be readily calculated. By multiplying the cost of a ton-mile of transportation by the number of ton-miles per year that can reasonably be expected from the truck, a figure is obtained for the gross annual gain, which, of course, must be reduced by the annual amortization and interest on the additional cost due to the use of aluminum alloy, in order to obtain the net gain.

Lacquer Makers Set Up Fund

NEW YORK, July 13—A number of manufacturers of lacquer, and others interested in the industry, have contributed to a fund for research on the present status of the patent situation in the low-viscosity nitrocellulose branch of the art. One of the objects of the fund, as stated in an announcement from Singmaster and Breyer, who are representing contributors to the fund who do not wish to have their names appear directly, will be to keep contributors to the fund informed of suits and other developments arising from the patent situation.

Trustees for the fund have been named as follows: Adrian D. Joyce, president, the Glidden Co.; William M. Rand, vice-president, the Merrimac Chemical Co.; Lawrence Phillips, president, Valentine & Co.; William C. Dabney, vice-president, Jones-Dabney Co.; and W. I. Longworth, secretary and general manager of the Lilly Varnish Co.

Contributors to the fund, in addition to companies represented by trustees, at the time of making the announcement were: Cook Paint & Varnish Co.; Gilbert Spruance Co., and Singmaster and Breyer, for companies not named.

July 18, 1931

+ + CALENDAR + + OF COMING EVENTS

SHOWS

International Garage Exposition, Berlin Germany May 9-Aug. 9
Olympia Passenger Car Show, London Oct. 15-24
Olympia Truck Show, London... Nov. 5-14
Passenger Car Show, Glasgow... Nov. 13-21
Motorcycle Show, London... Nov. 30-Dec. 5

CONVENTIONS

Southern Automotive Jobbers, Asheville, N. C. July 20-22
S.A.E. Aeronautic Meeting (in conjunction with Natl. Air Races), Cleveland, Ohio Sept. 1-3
Eastern States Exposition, Springfield, Mass. Sept. 20-26
American Welding Society, Boston, Mass. Sept. 21-25
American Electric Railway Assn., Atlantic City, N. J. Sept. 26-Oct. 2
S.A.E. National Production Meeting, Detroit Oct. 7-8
National Safety Council, Chicago, Ill. Oct. 12-16
Society Industrial Engineers, Pittsburgh, Pa. Oct. 14-16
Transportation Meeting, S.A.E., Washington, D. C. Oct. 27-29
American Chemical Society, Buffalo, Aug. 31-Sept. 4
American Society Mechanical Engineers (General Meeting), Kansas City Sept. 7-9
W. Va. Motor Transportation Assn., Charleston Sept. 11
Society for Elec. Development, New York City Sept. 11
Steel Founders Society, Chicago... Sept. 17
American Institute Mining and Metallurgical Engineers—Iron and Steel Division, Boston Sept. 21-24
American Society for Steel Treating (National Metal Exposition), Boston Sept. 21-25
American Society Mechanical Engineers—Machine Shop Practice, Boston Sept. 21-26
American Gear Mfg. Assn., Pittsburgh Oct. 15-17
National Hardware Assn., Chicago, Oct. 19-22
American Iron and Steel Institute, New York City Oct. 23
American Railway Assn.—Motor Transport Division, Chicago Oct. 27-28
American Society Mechanical Engineers—Annual meeting, New York City Nov. 30-Dec. 4
American Roadbuilders Association, Detroit, Mich. Jan. 11-14, 1932

Develops Tubeless Tire

AKRON, July 13—A tubeless tire has been developed by the B. F. Goodrich Co. for industrial and agricultural tractors.

Goodrich has named the new development the "zero pressure" tire. Its construction is a rubber arch built on a perforated steel base for application to standard solid tire wheels.

Goodrich is making the tires in 34 x 7 and 46 x 11 sizes. Other sizes are planned.

Export Markets Need Cultivation

Dr. Julius Klein Outlines Procedure For Healthy Sowing

(Continued from page 78)

tant stabilizing force in the industry.

It makes possible increased production and thereby exerts a beneficial influence upon our domestic market.

Its preservation and expansion are matters of interest not only to the foreign dealer and the American manufacturer, but also to the American dealer and, in fact, to everyone of the vast multitude of people whose lives are affected by the automobile industry.

In conclusion, I should like to re-emphasize a few points which I believe to be of essential importance to this subject.

In the first place, we must recognize the existence of a great potential demand abroad for automobiles. As competition increases, more and better sales efforts and intelligent merchandising campaigns may be required to exploit that demand, but the important fact is that the demand is there. That demand will be supplied from some source.

In the past, a great share has been held by the United States; our task is to maintain and even increase that share in the future. To do this the automotive industry will have to be equipped with the best available current information on economic and market conditions without which an intelligent and fruitful application of efforts in the right direction is impossible.

In this campaign to increase our automotive export trade the Department of Commerce, through its domestic and foreign organizations, can be depended upon to lend full cooperation.

Graham Names McMeans

A. L. McMeans, a veteran automobile man, has been appointed San Francisco district manager for the Graham-Paige Motors Corp., it is announced by C. W. Matheson, general sales manager.

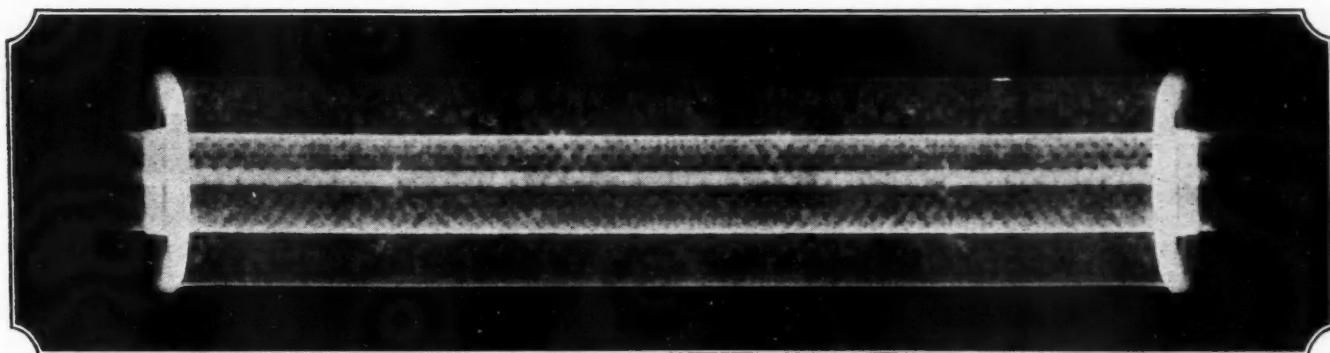
Mr. McMeans was secretary of the original Dodge Bros. organization from 1902 to 1906. With Oakland, from 1924 to 1927, he built up a strong dealer organization along the Pacific slope, and later organized the De Soto dealer force in the same territory, having served with that company as district manager from 1928 until this year.

Reo Exports Improve

LANSING, MICH., July 13—Reo Motor Car Co. reports export shipments for June exceeded any previous month this year.

Automotive Industries

Don't Compromise Power Loss To Obtain Efficient Silencing



Radiograph Courtesy General Electric X-Ray Corporation

The above Radiograph (not retouched) shows the straight-through construction of the Burgess Full Power Muffler. It clearly shows the perforated inner tube through which the exhaust gases pass without restrictions thus eliminating back-pressure upon the motor. The noise of the engine explosions expands through the small perforations in the inner tube into the sound absorbing material which is completely encased with an outer metal shell.

BURGESS Straight-thru Muffler Construction gives the engineer greater leeway in delivering that added horsepower—that added mile per hour, top speed *plus satisfactory silencing.*

Increased engine output—as much as seven horsepower saved—has resulted in the standardization of Burgess Full Power Mufflers on many of America's finest cars. This same accomplishment can be made for you.

Burgess Full Power Mufflers cause no more back-pressure than an equivalent length of straight pipe, yet their silencing ability is pronounced.

Burgess engineers specialize in the study of noises in automobiles, aeroplanes, air ducts, buildings, ventilators, motor boats, —in fact, acoustics in general. Our engineers are ready to help solve your noise problems.

BURGESS BATTERY COMPANY
111 WEST MONROE STREET
CHICAGO

BURGESS

ENGINEERS AND MANUFACTURERS OF ELECTRIC AND ACOUSTIC PRODUCTS

NEW DEVELOPMENTS

Automotive Parts, Accessories and Production Tools

Gleason Spiral Cutter Sharpener

CIRCULAR cutters used on the small Gleason spiral bevel gear generators can be sharpened economically on the No. 6 spiral cutter sharpener recently announced by the Gleason Works, Rochester, N. Y. It will sharpen cutters up to and including



6 in. diameter for cutting by the spread blade, duplex spread blade or standard method.

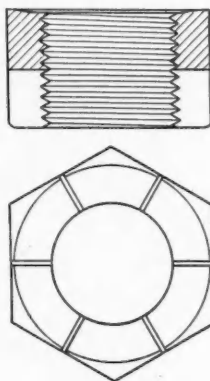
The cutter to be sharpened is mounted on the cutter spindle which is adjustable for setting to any desired cutting angle. The head which carries this spindle is then swung to and fro to move the cutting edge of the blade across the face of the grinding wheel. The proper setting of the cutter is obtained with conveniently located hand nuts and a gage is provided for checking the sharpening of the cutter. The grinding wheel is dressed to the correct angle by a diamond which is swung to and fro across the face of the wheel.

The wheel spindle drive is a one hp. constant speed motor, 1800 or 1500 r.p.m. Floor space required is 31 x 39 in. Net weight 1500 lb.

Marsden Locknut

THIS locknut, which is being manufactured by the American Marsden Company, Jersey City, N. J., is similar to an ordinary nut, the only

differences being that the upper part of the nut has a number of radial slots cut in it and that the bottom is dished or recessed. When the locknut is tightened up with the wrench it is elastically deformed so that the clearance between the threads in the upper part and the threads of the screw is taken up. There is then frictional contact between the threads of the nut



and the screw on both sides, which produces a locking effect. The thread of the nut is not deformed and it is claimed that by reason of the tight fit of the upper threads the resistance of the nut to stripping is increased.

Toledo Offers Dripless Valve

A SOLENOID-OPERATED dripless valve, which can be used to advantage in connection with dynamometer installations for the determination of fuel consumption, has been developed by Toledo Precision Devices, Inc., Toledo, Ohio, and is illustrated herewith. It is so arranged that when the current is on, the valve is open, and when the current is interrupted, the valve closes. The valve seat is placed at the outlet, so that no liquid can flow after the valve is closed.

It is claimed for this device that it permits of measuring quantities of liquid exactly, as the flow can be stopped instantly. It was designed primarily for use with the Toledo Scale electric cut-off weighing device. With this attachment the liquid passes through a valve and flows into a container on the scale. As the container fills, the weight of its contents is automatically registered on the scale dial by the indicator. When the indicator reaches any predetermined weight, it passes over the "elec-

tric eye," intercepting a beam of light falling on the "eye," thereby automatically shutting off the current and stopping the flow through the valve.

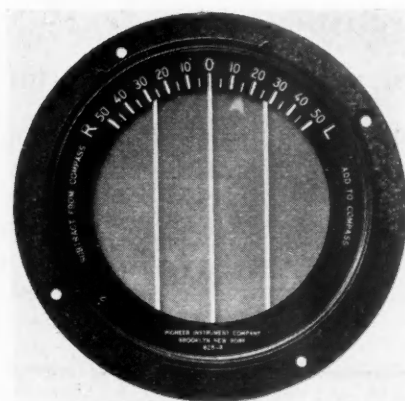


This valve is adapted for use in any filling operation where exact weights are essential. It comes in ½ in., 1 in., and 2 in. sizes.

Drift Indicator By Pioneer

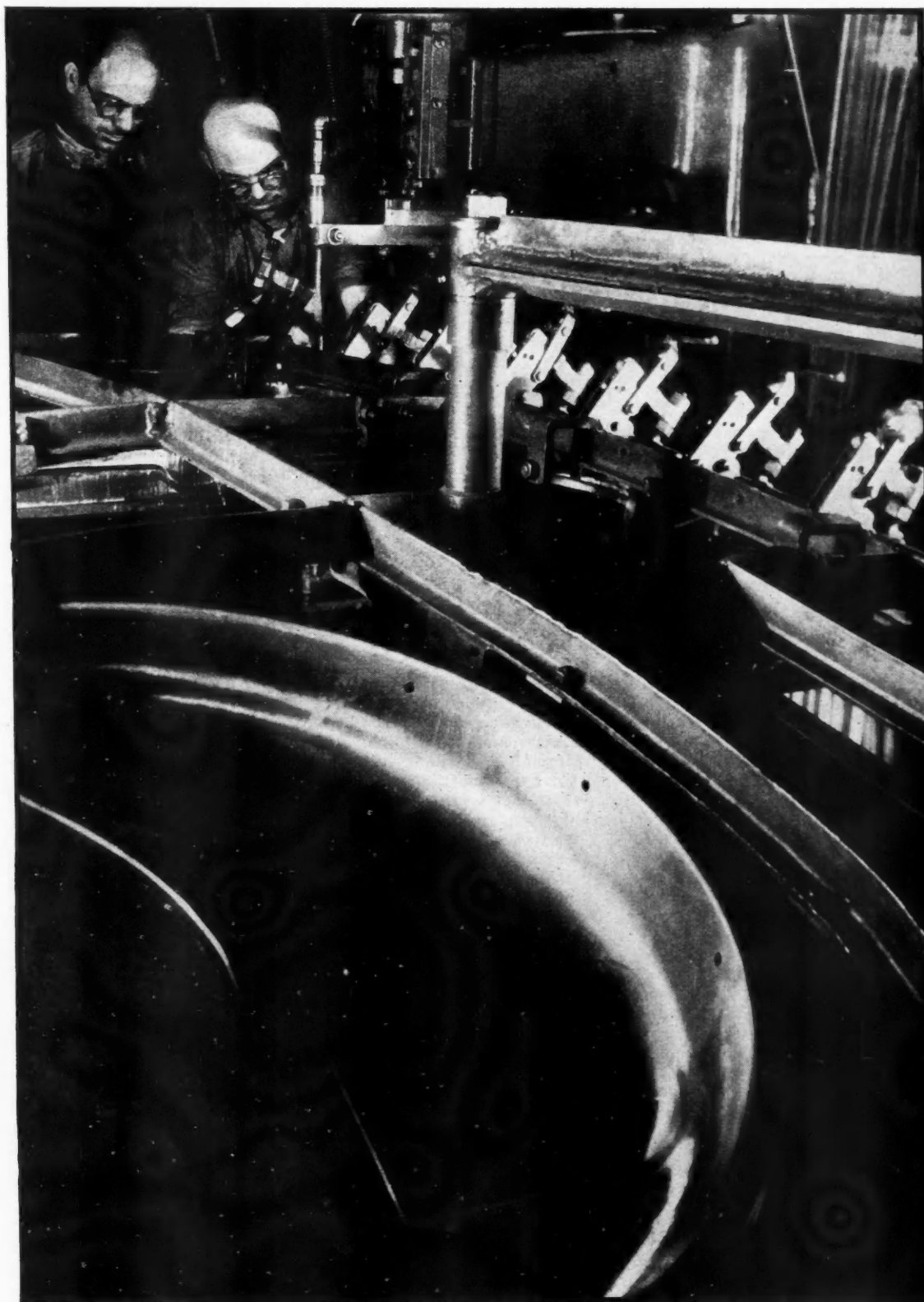
A NEW drift indicator has been placed in production by the Pioneer Instrument Co., Brooklyn, N. Y., a division of Bendix Aviation Corp. It is of simple construction and is installed in the bottom of the cockpit, where it may be read easily.

The top is essentially a ground glass screen, 3½ in. in diameter, with a lens inserted in the bottom of its funnel-shaped case.



Ground objects appear to travel across the screen in the direction of the moving airplane, and by rotating the screen until the objects travel parallel with sight wires, the pilot can read his drift angle from the scale on the instrument.

Automobiles are so good to-day that the importance of small body noises or other minor imperfections is bound to be magnified. In the one-piece body Budd safeguards the littlest things. For example, a jig, holding the whole side of a body, has been devised to insure the faultless spot welding of rain gutters to the body. Such attention to seemingly trivial details is one of the reasons why Budd one-piece bodies are uniformly free from small flaws . . . and permanently quiet.



★ BODIES BY BUDD ★

Originators of the All-Steel Body. Used to-day by manufacturers in the United States, Great Britain, France and Germany.

Automotive Industries

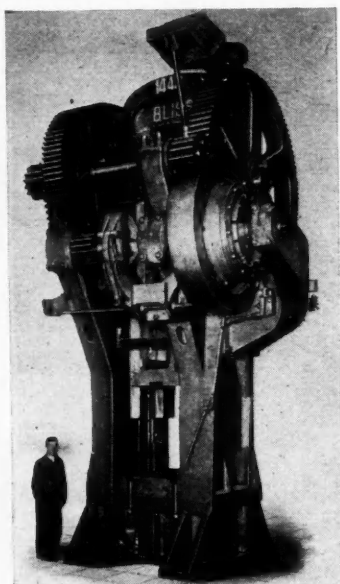
July 18, 1931

NEW DEVELOPMENTS

Automotive Parts, Accessories and Production Tools

Bliss Single Crank Presses

ACCORDING to a recent announcement, the E. W. Bliss Co., Brooklyn, N. Y., has designed their line of large single crank presses of straight-sided construction. An installation has been made recently in a large wheel plant to produce hubs and brake drums.



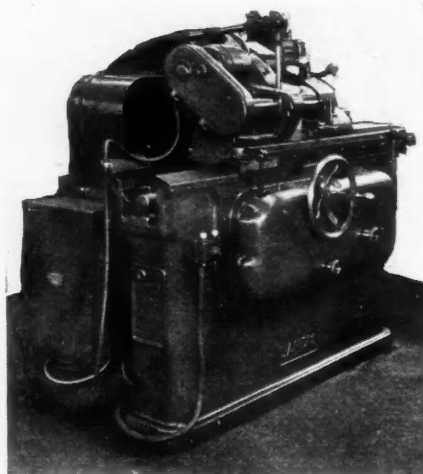
One of this series shown here is of heavy construction, twin-drive, double-gear and with a semi-automatic multiple-disk friction clutch. The bed is designed for maximum stiffness. Its vertical webs are all in line with the tie rods. The tie rod nuts are seated at the level of the feet, thereby eliminating any weakness due to the use of nut pockets.

A new feature is the incorporation in the housing casting of the back brackets which heretofore have always been belted to the housing.

Depending upon the required stroke, the crankshafts are of the full eccentric, semi-eccentric or cheeked crank type. The connection is a new (patented) type with motor-driven screw adjustment.

Landis C 6" Plain Hydraulic Grinders

THE Landis 6 in. hydraulic grinder Type C was developed to make available a comparatively small rapid traverse plain grinding machine, highly flexible but suitable for the



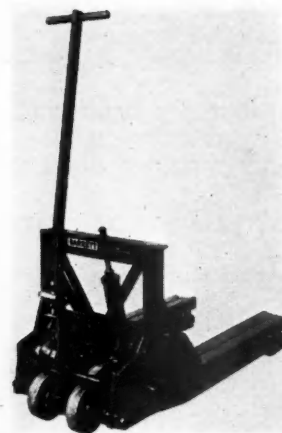
mass production of light parts. It is recommended for such work as universal joint spiders, small bearings, small motor armatures, light shafts and the like. Outstanding features are productiveness coupled with ease of operation achieved by smoothness of all machine movements. Hydraulic table traverse gives a range of table speeds from 6 in. to 240 in. per minute. Depending upon the use to which the machine is to be put, other hydraulically controlled movements may be supplied. The hydraulic system consists of a twin-cylinder type table traversing mechanism and a Tuthill internal geared oil pump.

The bed is of box type construction. The water reservoir is integral with it, while its base forms a reservoir for the oil used by the hydraulic traversing system. The grinding wheel head is supported by a V and a flat guide with chilled surfaces. Steel back babbit wheel spindle bearings are used, lubrication taking place continuously. The spindle is driven through multiple V bolts from a balanced motor mounted on top of the wheel base casting at the rear.

This machine is available in a 6 in. x 18 in. size which weighs 3750 lb. net, without electrical equipment; also a 6 in. x 30 in. size which weighs 4000 lb. net, without electrical equipment. Constant speed motors are used throughout. A 1/2 hp. for the headstock, a 1 hp. for the pump drive, 3 hp. for the wheel spindle drive.

Barrett Lift-Truck

A FORK type lift-truck for handling tin plate and sheets has been placed on the market by the Barrett-Cravens Co., Chicago, Ill. It is

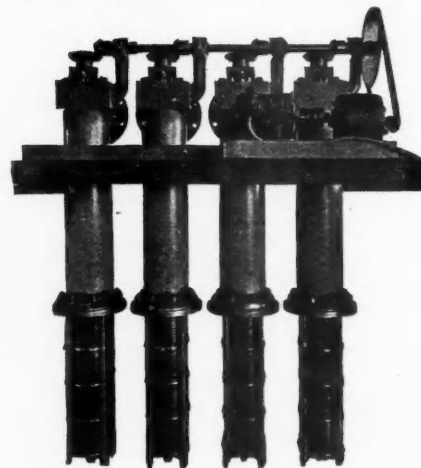


3 1/2 in. high to go under stacks of tin plate which are shipped on 2 x 4's.

With the lift-truck, a pile of tin plate is lifted and trucked from the freight car to the desired storage space in the plant, thus eliminating piling in the car and unpling for storage, which was formerly necessary.

Cuno Continuously Cleanable Strainer

TO extend the industrial applications of a filter with a proved record on many fine machine tools, the Cuno Engineering Corp., Meriden, Conn., is offering the Auto-Klean strainer for use in automotive plants. It is of all-metal disk construction, entirely and positively cleanable, without disassembly, by rotation of a central projecting spindle, yet is obtainable with spacing equivalent to the finest mesh.



In the plant of one large motor car manufacturer a bank of these strainers handles the coolant which is supplied to more than 200 machines and has a capacity of 125,000 gal. per hour.

Units of all sizes and capacities are made and may be obtained in materials suited to any condition of service. They are furnished complete with sumps of various sizes and for low or high pressure service, or without sump for use in connection with other apparatus.